Chapter 4 Agriculture and Rural Setting in Mizoram

4.1 Natural and Social Conditions

4.1.1 Agro-ecology

India is divided into 24 agro-climatic zones using Thornthwaite indices. The Planning Commission of GOI divided the country into 15 broad agro-climatic zones based on physiography and climate during the appraisal of the 7th Five-year Plan (1985-1990). Emphasis was given on the development of resources and their optimum utilisation in a suitable manner within the framework of resources constraints and potentials of each region. Mizoram is classified as "Eastern Himalayan Region" together with six other northeastern states, characterised by high rainfall, high forest cover, heavy soil erosion and floods.

Mizoram State is further divided into three sub-agro-climatic zones, namely: Humid Mild Tropical Hill Zone situated in the western side of the state; Humid Subtropical Hill Zone in the central part of the state; and Humid Temperate Subalpine Zone in the eastern side.

Table 4.1.1 gives the geographic features and characteristics of the respective agro-climatic zones and Figure 4.1.1 shows the demarcation of the three agro-climatic zones.

Table 4.1.1 Geographic and Characteristic Features of Agro-climatic Zones in Mizoram

Agro-climatic Zone	Altitude Range (AMSL, m)	Annual Average Rainfall (mm/year)	Mean Temperature (Max~Min) (°C)	Administrative District	Major Farming System
Humid Mild Tropical Hill Zone	200 ~ 800	2,000 ~ 3,000	30 ~ 12	- Kolasib (North) - Mamit (West) - Lunglei (West) - Laungtlai (West and Centre) - Saiha (West)	Irrigated paddy and various horticulture crops taking advantage of moderate slope and water
Humid Subtropical Hill Zone	1,000 ~ 1,500	2,500 ~ 3,000	30 ~ 12	- Kolasib (South) - Mamit (East) - Aizawl (except Southeast) - Serchip (West and Centre) - Lunglei (Center) - Lawngtlai (East) - Saiha (Centre)	Mixed cropping of upland rice with vegetables predominantly in jhum culture for self-sufficiency
Humid Temperate Sub-alpine Zone	1,500 ~	2,000 ~ 3,000	11 ~ 20	- Aizawl (Southeast) - Champai - Serchip (East) - Lunglei (East edge) - Lawngtlai (East edge) - Saiha (East)	Self-sufficient agriculture relying on jhum, cropping upland rice and horticulture crops on steep slope

Source: Agriculture Department (CH), JICA Study Team

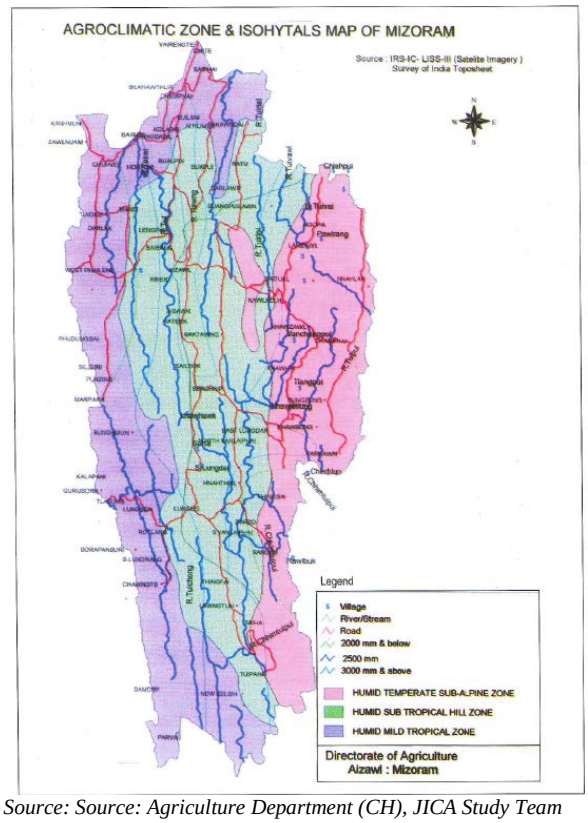
4.1.2 Topography

The state's topography is, by and large, mountainous with steep slopes forming deep gorges culminating into several streams and rivers. Almost all the hill ranges traverse in the north-south direction. The eastern part of Mizoram is at a higher elevation compared with the western part. The highest peak is 2,165 m above mean sea level (AMSL) at the top of Blue Mountain, called Phawngpul, and the average height of hill ranges is about 920 m AMSL. There are 15 major rivers in the state, of which seven rivers, namely: Tulvawi, Tuvai, Tuirini, Tlawng, Tut and Teirei, flow northward and ultimately confluence with the Barak River in Assam Valley. The five other rivers, namely: Mat, Tuichang, Khawchhaktuipui, Tiau and Chhimtuipui (Kolodyne) flow southwards. The remaining three rivers, namely: Tuichawng, De and Khawthlangtuipui, flow to the west. In the south of Mizoram, the Kamaphull River flows in the northward direction and then enters Bangladesh. The Kolodyne River in southern Mizoram flows southwards and enters Myanmar. Both the Kolodyne and Krnaphuli rivers are large and navigable to a great extent, leading to the ports of Akyab in Myanmar and Chittagong in Bangladesh, respectively.

Both Table 4.1.2 and Table 4.1.3 below show the numerical characteristics of Mizoram's topography. The first indicates the slope range-wise area distribution of the respective districts and the whole of Mizoram, and the second shows the altitude range-wise area distribution.

Interpreting the figures in the above two tables, the general features of Mizoram's topography are briefly explained below:

- The average land slope of Mizoram is estimated to be about 35% or 20°, and the majority of its land (80%) are on steep slopes ranging between 15% and 65% or between 10° and 30°;
- The higher altitude with steep slope topography is prevailing in the central to eastern parts along the border of Myanmar, covering the four districts of Aizawl, Champhai, Serchhip and Saiha, while four other districts have rather gentle topographies; and
- Mechanised farming would not be possible on more than half of the land where the slope is steeper than 15°.



Source: Source: Agriculture Department (CH), JICA Study Team

Figure 4.1.1 Agroclimatic Zones of Mizoram

Table 4.1.2 Slope Range-wise Area Distribution

Slope Range		Districts' Slope Range-wise Area Distribution (%)								Mizoram Slope-wise Area Distribution		
in %	in degree	Mamit	Kolasib	Aizawl	Champhai	Serchhip	Lunglei	Lawngtlai	Saiha	Km^2	%	Accum. %
Less 15%	Less 10°	17%	17%	7%	7%	9%	12%	16%	6%	2,412	11%	11%
15% -40%	10°- 20°	47%	51%	40%	41%	42%	44%	46%	36%	9,154	43%	55%
40% -65%	20°- 30°	26%	25%	38%	37%	36%	32%	28%	40%	6,899	33%	88%
65%-90%	30°- 40°	8%	6%	13%	11%	11%	9%	8%	14%	2,109	10%	98%
90% more	40°more	2%	1%	3%	3%	3%	2%	2%	3%	512	2%	100%
									Total	21,087	100%	

Source: Mizoram Remote Sensing Application Centre (MIRSAC) and JICA Study Team

Table 4.1.3 Altitude Range-wise Area Distribution

Altitude Range	Districts' Altitude Range-wise Area Distribution (%)								Altitude Range-wise Area Distribution		
(AMSL in meter)	Mamit	Kolasib	Aizawl	Champhai	Serchhip	Lunglei	Lawngtlai	Saiha	Km^2	%	Accum. %
Less 100 m	9%	17%	1%	0%	0%	8%	7%	1%	1,110	5.3%	5.3%
100 - 200 m	23%	29%	4%	0%	0%	11%	25%	5%	2,471	11.7%	17.0%
200 - 300 m	16%	15%	7%	0%	0%	10%	18%	7%	1,937	9.2%	26.2%
300 - 400 m	13%	12%	10%	0%	2%	11%	12%	9%	1,853	8.8%	35.0%
400 - 500 m	11%	10%	13%	1%	7%	13%	9%	9%	1,931	9.2%	44.1%
500 - 600 m	9%	7%	13%	4%	10%	12%	7%	8%	1,912	9.1%	53.2%
600 - 800 m	13%	8%	23%	16%	28%	19%	10%	15%	3,519	16.7%	69.9%
800 - 1,000 m	5%	3%	16%	24%	26%	10%	7%	15%	2,695	12.8%	82.6%
1,000 - 1,200 m	1%	1%	8%	24%	15%	4%	4%	12%	1,785	8.5%	91.1%
1,200 - 1,400 m	0%	0%	3%	17%	9%	2%	2%	9%	1,101	5.2%	96.3%
1,400 - 1,600 m	0%	0%	1%	10%	3%	0%	1%	6%	547	2.6%	98.9%
1,600 - 1,800 m	0%	0%	0%	4%	1%	0%	0%	2%	193	0.9%	99.8%
1,800 - 2,000 m	0%	0%	0%	1%	0%	0%	0%	0%	30	0.1%	100.0%
2,000 m more	0%	0%	0%	0%	0%	0%	0%	0%	2	0.0%	100.0%
(Max. 2,165 m)								Total	21,087	100%	

Source: Mizoram Remote Sensing Application Centre (MIRSAC) and JICA Study Team

4.1.3 Soil and Soil Erosion

(1) General Features of Soils

The geography of Mizoram is broadly divided into hills and valleys. Hills consist of (a) high hills above 1,300 m AMSL, (b) medium hills between 500 m and 1,300 m, and (c) low hills below 500 m. The hills run in a north to south direction parallel to each other with valleys in between them. Flat valley bottoms are found in the Tiau Valley and Champhai in the eastern part of Mizoram. Dissected hills and hill-rocks are predominantly found in most of the river valleys in the western part of the state. The soils of different geographic units are of homogeneous nature, and they are mainly derived from sandstones, shales and siltstones.

The hill slopes and valleys have soil orders of Ultisols and Entisols, respectively. They are further classified into Udults and Orthents at sub-order level, while Inceptisols are commonly found in the hills and valleys.

The surface soils of the hilly terrain are dark, highly leached and poor in bases, rich in iron and highly acidic with pH values from 4.5 to 5.5. These are well drained, deep to very deep, rich in organic carbon, low in available phosphate content and high in available potash. The textures of surface soils are loam to clay loam with clay content increasing with depth. The ratio of clay, silt and sand within the 50 cm of top soil in most cases is 20-30%, 35-45% and 25-45%, respectively. The pH and organic carbon content decrease and clay content increases with depth. The base saturation above a lithic or paralithic is mostly below 35%. These soils are capable of providing substantial oxygen supply for plant growth and have the capability to retain moisture and maintain its supply throughout the growing seasons of most crops.

Soils of the flat valley bottoms are brown to dark brown, poor in bases, moderately acidic with pH ranging from 5.5 to 6.0, medium to high in organic carbon content, low in available phosphate and medium to high in available potash. They are deep to very deep but moderate to poorly drained. The texture of the soils is mostly sandy loam to sandy clay loam. The ratio of clay, silt and sand in the upper 50 cm ranges from 15-35%, 5-34% and 40-75%, respectively. Clay content does not increase with depth. The soils below the plough layers in some places are so poorly drained that water logging in the depression is common. They are alluvial and colluvial, the most fertile and most productive soils irrespective of their elevation. Groundwater table is high, within one meter of the surface, during Kharif. They are utilised for cultivation of wet rice paddies.

The soils of narrow valleys have light and coarse texture. They are very well drained, well-aerated and skeletal, receiving new deposits of alluvium at frequent intervals. Most of them do not have pedogenic horizons. Lithologic discontinuity is common both in the soils of wide and narrow valleys. They are acidic, moderately rich in organic carbon, low in available phosphate and medium in available potash content. They are less fertile and mainly utilised for cultivation of paddies and vegetables.

(2) Soil Erosion

The Department of Agriculture has been conducting experiments in soil erosion since 1994 at different places in the state under various land covers. The experiments are conducted by two methods, i.e., (i) the soil loss measured tank method, and (ii) the contour trench method. The available data obtained from the experiments are given in Table 4.1.4.

The degree of soil erosion differs from place to place; however, the Department of Agriculture evaluates it to be as high as 16.84 Mt/ha/year on the average.

Table 4.1.4 Experiment Data of Soil Loss

Land Use	Slope	Soil Loss (Mt/ha/year)
1. Ginger cultivation (Kolasib)	30%	28.1
2. Sugarcane cultivation (Kolasib)	40%	12.9
3. Eucalyptus cultivation (Kolasib)	70%	21.7
4. Jhum paddy cultivation (Kolasib)	20%	23.5
5. Jhum paddy cultivation (Kolasib)	40%	31.0
6. Dense forest (Kolasib)	50%	6.0
7. Squash cultivation (Aizawl)	30%	7.8
8. Teak plantation (Aizawl)	2%	3.7

Source : Department of Agriculture

4.1.4 Land Use

Mizoram is still a non-land record state in terms of land record management. The Department of Land Revenue and Settlement is carrying out land use survey over the state land aiming for completion in the year 2020. The survey for the Lunglei District as a first target has been finished, and the Serichhip District is the next target. Therefore, it is difficult to estimate an accurate classification of present land use in Mizoram. The most probable area of classified land use may be interpreted from the three available sets of data concerning land use in Mizoram classified by different categories. These are: (i) land use statistics of Mizoram given in Statistical Handbook of Mizoram, (ii) forest classification given in India State of Forest (IFS) Report, and (iii) GIS data prepared by the Mizoram Remote Sensing Application Centre (MIRSAC). These three data sets are shown in Table 4.1.5.

Table 4.1.5 Land Use Data

Land Use Statistics (*1) (2011-2012)		Forest Classification (*2) (2011 Assessment)		GIS Data (*3) (Satellite Image in 2007)	
Classification	**Area (km^2)**	**Classification**	**Area (km^2)**	**Classification**	**Area (km^2)**
Forests	15,853	**Recorded forest area (*5)**	**16,717**	City	23
		・ Reserved forest	7,909	Town	37
Not available for cultivation	868	・ Protected forest	3,568	Village	83
		・ Unclassified forest	5,240	WRC	122
Barren and uncultivated land	83			Agriculture plantation	43
		Forest cover (*6)	**19,117**	Dense forest	3,158
Other uncultivated land excluding fallow land	528	・ Very dense forest	134	Medium dense forest	2,639
		・ Moderately dense forest	6,086	Less dense forest	3,780
Fallow land	2,443	・ Open forest	12,897	Bamboo	6,630
				Forest plantation	87
Net sown area	1,312			Abandoned jhum	1,091
(Net irrigated area) (*4)	(127)			Current jhum	2,869
				Scrub land	379
				Water body	102
				Unidentified	43
Total	21,087			Total	21,087

*(*1) Source : Statistical Handbook of Mizoram*
*(*2) Source : India State of Forest Report*
*(*3) Source : Mizoram Remote Sensing Application Centre (MIRSAC), and JICA Study Team*
*(*4) Area 127 ha included in Net Sown Area (1,312 ha)*
*(*5) the area recorded as a forest in the Government record*
*(*6) All lands, more than one hectare in area, with a tree canopy density of more than 10% irrespective of ownership and legal status. Such lands may not necessary be a recorded forest area. It also includes orchards, bamboo and palm*

Table 4.1.6 shows the figures estimated by the JICA Study Team as the most probable land use data through interpretation of the three data sets above. The forested area is more or less the same figure as that of the IFS report. The jhum land, irrespective of whether it is abandoned or being cultivated, occupies about 19% of state land, and would be categorised as open forest in the IFS report or as barren and uncultivated land, fallow land and net sown area given in the land use statistics.

Table 4.1.6 Estimated Land Use in Mizoram

Classification	Area (km^2)	Ratio (%)
City, urban, village and infrastructure	143	0.6
Forest	16,586	78.7
Agriculture - WRC - Upland crops - Agroforest and plantation	252 (122) (43) (87)	1.2
Jhum	3,960	18.8
Water body, etc.	146	0.7
Total	21,087	100.0

Source : JICA Study Team

4.1.5 Shifting Cultivation (Jhum)

(1) Jhum Practices[1]

The practice of jhum farming is slashing, burning and cropping without tilling the soil, and the cropped land is subsequently fallowed to attain pre-slashed forest status through natural succession. All agricultural operations are performed manually, using only a few traditional and primitive tools, and regeneration of forest and soil fertility are achieved cost-free and effortlessly. Cropping on jhum lands in Mizoram is predominantly practiced for one year. Farmers have a general apprehension that the yields obtained from the second year of cropping are far less than those cropped in the new areas; hence, the second year cropping is scarce.

Rice is the main crop in jhum farming. Two varieties of upland rice, namely, "buhpui" and "tai" are popular among farmers. Mostly, rice is grown in monoculture; however, several crops are also mixed with rice in some areas, depending upon the requirements of the family. These crops include maize, colocasia, brassica, chillies, sesamum, brinjal, ginger, cotton, and tapioca. A shifting cultivator is allotted for a jhum field through a lottery system by the village council. The area to be cultivated is decided by the cultivator on the basis of size and working capacity of his family. The forested fallow is slashed and cleared from December to January. The burning is done in March to April. Rice is sown mostly from the middle of April to the middle of May. Weeding is done twice or thrice from July to September, and rice is harvested from the end of October until the beginning of November.

After the harvest, the land is left fallow and vegetative regeneration is allowed on it until the land becomes reusable. In the past, jhum cycle was longer (15-25 years), but it was reduced to 5-6 years, resulting in problems of land degradation and threats to the ecology.

(2) Distribution of Jhum Land

The jhum land in Mizoram, both abandoned and current, is estimated at 3,960 km^2, corresponding to about 19% of the state as mentioned above in the land use estimate. The district-wise distribution of jhum land is shown in Table 4.1.7.

Table 4.1.7 District-wise Jhum Land Distribution

District	Area (km^2)	Area (km^2)	Area (%)	Distr. (%)	Area (km^2)	Area (%)	Distr. (%)	Area (km^2)	Area (%)	Distr. (%)
Mamit	3,054	172	6%	16%	438	14%	15%	609	20%	15%
Kolasib	1,586	88	6%	8%	226	14%	8%	313	20%	8%
Aizawl	3,118	161	5%	15%	307	10%	11%	468	15%	12%
Champhai	3,396	162	5%	15%	565	17%	20%	726	21%	18%
Serchhip	1,441	68	5%	6%	235	16%	8%	303	21%	8%
Lunglei	4,518	254	6%	23%	619	14%	22%	873	19%	22%
Lawngtlai	2,458	139	6%	13%	329	13%	11%	468	19%	12%
Saiha	1,516	48	3%	4%	151	10%	5%	199	13%	5%
Total	21,087	1,091	5%	100%	2,869	14%	100%	3,960	19%	100%

Source : Mizoram Remote Sensing Application Centre (MIRSAC), and JICA Study Team

Table 4.1.8 shows the distribution of jhum land on land slope and altitude basis.

Table 4.1.8 Land Slope-wise and Altitude-wise Jhum Distribution

(1) Land Slope-wise Jhum Distribution						
Slope (Degree)	Abandoned Jhum		Current Jhum		Jhum Land Total	
	Area (km^2)	Distr. (%)	Area (km^2)	Distr. (%)	Area (km^2)	Distr. (%)
< 30% (< 17°)	423	39%	1,042	36%	1,465	37%
30% - 40% (17°-21°)	215	20%	533	19%	748	19%
40% - 50% (21°-26°)	178	16%	468	16%	646	16%

[1] Referring to a research paper by Tawnega, et. al. titled "Evaluating Second Year Cropping on Jhum Fallows in Mizoram, Northeastern India - Phytomass Dynamics and Primary Productivity", June 1996.

50% - 60% (26°-30°)	123	11%	346	12%	468	12%
> 60% (>30°)	153	14%	480	17%	633	16%
Total	1,091	100%	2,869	100%	3,961	100%
(2) Altitude-wise Jhum Distribution						
< 500 m amsl.	525	48%	1,041	36%	1,566	40%
500 – 1,000 m	440	40%	1,169	41%	1,609	41%
1,000 – 1,500 m	120	11%	593	21%	713	18%
> 1,500 m	7	1%	66	2%	73	2%
Total	1,091	100%	2,869	100%	3,960	100%

Source : Mizoram Remote Sensing Application Centre (MIRSAC), and JICA Study Team

From Table 4.1.8, geographical features of jhum in Mizoram are summarised below:

- Except Saiha District, the area of about 20% land is occupied by jhum land;
- The majority of jhum is practiced on land with slope less than 40% or 21º, and about one third of the area is on steep slope ranging from 40% to 60%; and
- Jhum is practiced on land lower than 1,000 m AMSL.

4.1.6 Rainfall and Climate

(1) Rain Gauge Station

There are 46 rain gauge stations in Mizoram being operated and maintained by the following departments:

- Department of Agriculture (DOA): 36 stations operating for 27 years from 1986 to date;
- Department of Economics and Statistics: 3 stations for 6 years from 2007 to date; and
- Rural Development Department: 7 stations for 6 years from 2007 to date.

Other than the above, the Central Water Commission (CWC) and the Power and Electric Department (PED) installed and operated some rain gauge stations in conjunction with runoff gauging stations for hydropower development purposes. The JICA Study Team obtained daily rainfall records of two stations for a limited duration.

Out of 46 rain gauge stations, rainfall data recorded at DOA's 26 stations are employed for this study because of shorter observation period and lack of daily records at two other departments' stations. While DOA's data recorded from 1986 to 1998 are scarce, available in only 14 stations with considerable lack of observation, the data since 1999 were therefore employed for further meteo-hydrological analysis in this study. The features of 26 rain gauge stations are shown in Table 4.1.9, including locations of stations and the month when daily rain records were available.

Table 4.1.9 Place and Recording Period of Rain Gauge Stations

Sr. No.	District	Place	Operator	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Mamit	Mamit	DOA															
2		Kawrtethawveng	DOA															
3		Zawlnuam	DOA															
4		Rengdil	DOA															
5	Kolasib	Kolasib	DOA															
6		Bilkhawthlir	DOA															
7		Bukpui	DOA															
8	Aizawl	Aizawl	DOA															
9		Sialsuk	DOA															
10		Neihbawi	DOA															
11		Darlawn	DOA															
12		Khawruhlian	DOA															
13		Sairang	DOA															
14	Champhai	Champhai	DOA															
15		Khauzawl	DOA															
16		Vaphai	DOA															
17		Ngopa	DOA															
18	Serchhip	Serchhip	DOA															
19		N. Vanlaiphai	DOA															
20	Lunglei	Lunglei	DOA															
21		Tlabung	DOA															
22		Hnahtthial	DOA															
23		S. Vanlaiphai	DOA															
24	Lawngtlai	Lawngtlai	DOA															
25	Saiha	Saiha	DOA															
26		Tuipang	DOA															

: Daily rainfall data recorded, : Lack of rainfall record, 2013 upto September

Source : Department of Agriculture (DOA), and JICA Study Team

(2) Rainfall Pattern

The historical maximum and minimum annual rainfall were 4,700 mm, recorded in 2000 at Lunglei in Lunglei District, and 1,367 mm in 2011 at Vaphai in Champhai District, respectively. The average annual rainfall in Mizoram State is about 2,550 mm for the last 14-year period, and in Aizawl, it is 2,343 mm as shown in Table 4.1.10

Table 4.1.10 Average Annual Rainfall Recorded in Aizawl

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Ave. rainfall	8	12	67	165	399	378	343	379	385	159	39	9	2,343

Source : Department of Agriculture (DOA), and JICA Study Team

The period from November to March is the dry season called 'Rabi' and the rest is the rainy season called 'Kharif'. The Kharif's rain concentration is distinct, having 95% rain in a year. Figure 4.1.2, Figure 4.1.3 and Figure 4.1.4 show the isohyetal maps of annual average, Kharif average and Rabi average rainfalls, respectively. These isohyetal maps indicate that annual rainfall in the humid subtropical hill zone situated in the central part of Mizoram is predominant rather than the other two agroclimatic zones.

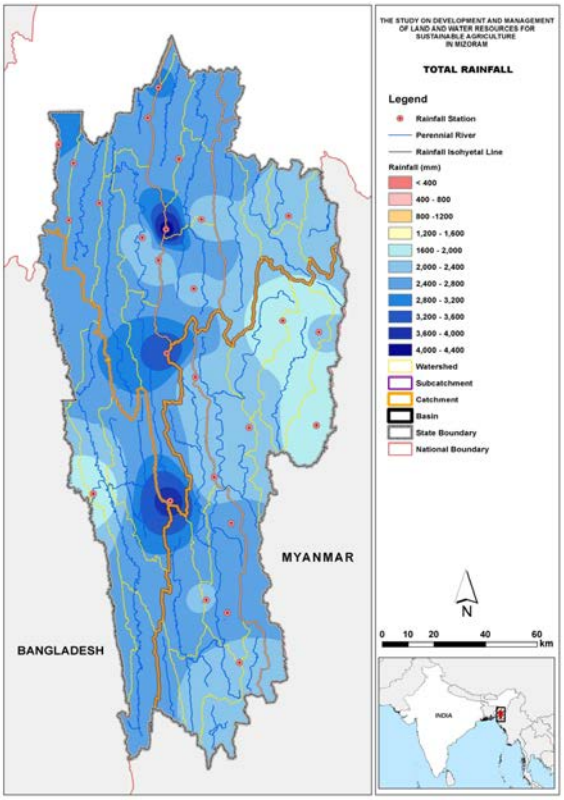
(3) Climate

Meteorological data other than rainfall are available only in Aizawl. The average maximum and minimum temperature recorded during 2007 to 2012 are 29°C in April and 12°C in January. The humidity ranges from 91% to 99% in the rainy season and 80% to 87% in the dry season. The wind is generally mild, being observed at Aizawl Airport ranging from 1.0 m/sec in the rainy season to 0.4 m/sec in the dry season.

4.1.7 River and Hydrology

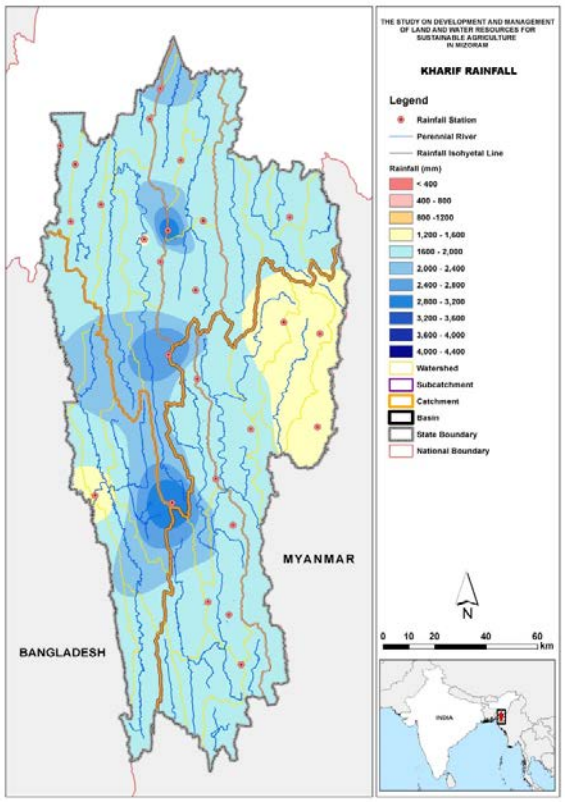
(1) Rivers and River Basins

Mizoram, with an area of 21,087 km^2, is largely divided into three major river basins: one is the Barak basin (8,935 km^2) in the central to northern part of the state, the second is Kolodyne basin(8,144 km^2) in the southeastern part, and the third is Karnaphuli basin(3,999 km^2) in the southwestern part, as shown in Figure 4.1.5.



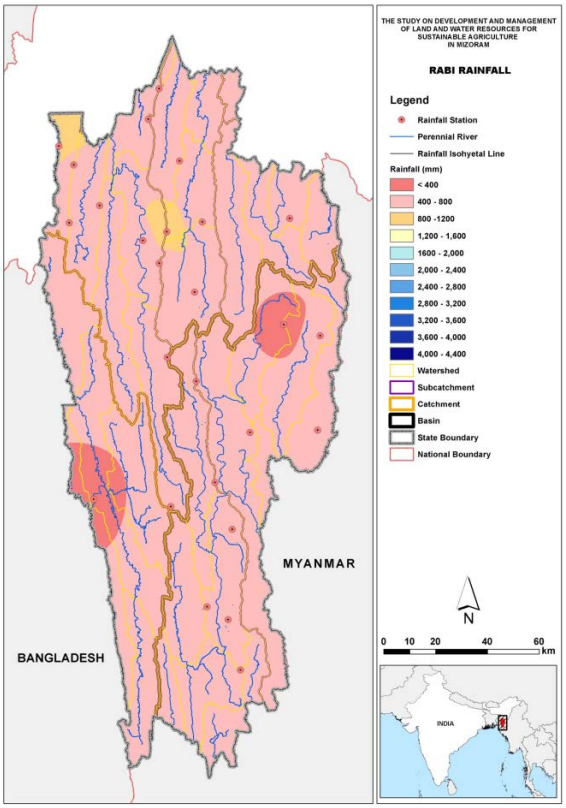
Source : JICA Study Team

Figure 4.1.2 Isohyetal Maps of Annual Average Rainfall



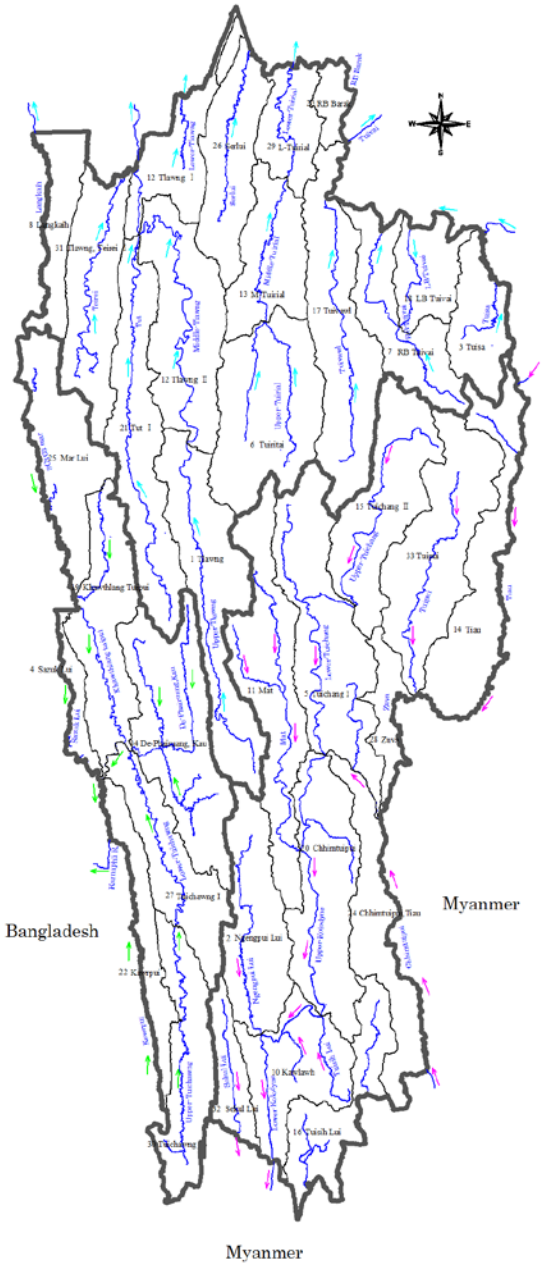
Source : JICA Study Team

Figure 4.1.3 Kharif Average Rainfall



Source : JICA Study Team

Figure 4.1.4 Rabi Average Rainfall



Source: MIRSAC

Figure 4.1.5 Map of Rivers and River Basins of Mizoram

Table 4.1.11 Rivers in Mizoram

ID No.	WS-Code	Name of River	Basin	Catchment Area (km^2)
1	3c2a9a5c	Tlawng	Barak River	919.8
3	3c2f5a1a	Tuisa	Barak River	394
6	3c2b5d1c	Tuiritai	Barak River	945.2
7	3c2f2a1a	RB Tuivai	Barak River	560.3
8	3c2a2a2c	Langkaih	Barak River	347.4
9	3c2a8a3c	Tlawng II	Barak River	832.9
12	3c2a6c5f	Tlawng I	Barak River	417.8
13	3c2b4a1b	M-Tuirial	Barak River	524.8
17	3c2f1a1a	Tuivawl	Barak River	963
18	3c2f3a5c	LB Tuivai	Barak River	348.2
21	3c2a7a1a	Tut I	Barak River	887.4
23	3c2c6a3f	RB Barak	Barak River	130.5
26	3c2b2a2d	Serlui	Barak River	580.3
29	3c2b3a1a	L-Tuirial	Barak River	397.8
31	3c2a5a2d	Tlawng, Teirei I	Barak River	685.3
Barak basin total				8,934.7
2	3d1a4e5d	Ngengpui Lui	Kolodyne River	673.3
5	3d1b2h2d	Tuichang l	Kolodyne River	1,024.9
10	3d1a3g2d	Kawlawh	Kolodyne River	615.7
11	3d1a6o5d	Mat	Kolodyne River	928.2
14	3d1b6h3d	Tiau	Kolodyne River	775.7
15	3d1b3e2c	Tuichang ll	Kolodyne River	778
16	3d1a2e3e	Tuisih Lui	Kolodyne River	524.5
20	3d1a5p3b	Chhimtuipui	Kolodyne River	829.2
24	3d1b1d1a	Chhimtuipui, Tiau	Kolodyne River	598.4
28	3d1b4c3c	Zuva	Kolodyne River	210.3
32	3d1a1b3d	Sekul Lui	Kolodyne River	252
33	3d1b5e5e	Tuipui	Kolodyne River	934
Kolodyne total				8,144.2
4	3c3c1d2c	Sazuk Lui	Karnaphuli River	144.5
19	3c3c2p1d	Khawthlang Tuipui	Karnaphuli River	693.4
22	3c3c7a1a	Kawrpui	Karnaphuli River	356.5
25	3c3c3d3c	Mar Lui	Karnaphuli River	648.4
27	3c3c5a2a	Tuichawng I	Karnaphuli River	573.1
30	3c3c6b1a	Tuichawng	Karnaphuli River	605.3
34	3c3c4w2b	De-Phairuang, Kau	Karnaphuli River	977.3
Karnaphuli basin total				3,998.5
Total				21,077.4

Source: Mizoram Remote Sensing Application Centre (MIRSAC) and JICA Study Team

The major tributaries of Barak basin, flowing northwards, are the Tlawng, Tuirial and Tuivawl, which joins the Barak River in Assam. The rivers Barak, Tlawng, Tuivawl and Tuirial are navigable for considerable stretches, and are used for transporting floated timber and bamboo from Mizoram to Assam, and various commodities between the two states. The Kolodyne River, with four main

tributaries, Mat, Tuichang, Tiau and Tuipui, flows into Mizoram from Myanmar and turn west and then southward within Mizoram and returns to Myanmar. Some of its stretches in Mizoram are navigable although interrupted by rapids. The Karnaphuli and its tributaries, Tuichawng, De-Phairuang, Kau, and Khawthlang Tuipui, form the western drainage system. The Karnaphuli enters Bangladesh at Demagiri, and at its mouth sits the port city of Chittagong. These rivers flowing in Mizoram are listed with their catchment areas in Table 4.1.11.

(2) Runoff Measurement

Runoff measurement is undertaken by two agencies, the Central Water Commission (CWC) and Power and Electrification Department (PED) at 18 points mainly for hydropower development purposes as shown in Table 4.1.12. Access to the CWC data is hardly possible for security reasons, hence, runoff records of the Tuivawl River in the northern part of Mizoram were made available to the JICA Study Team, and those at the 11 other points are still pending. Meanwhile, the quality of PED's data is considered to be insufficient for the study.

(3) Hydropower Generation

Mizoram is expected to have hydroelectric power potential of about 4,500 MW, of which only 0.6% (29.35 MW) is developed so far. There are 11 existing hydropower stations and one hydropower station is under construction. Table 4.1.13 shows the features of these hydropower generation stations.

Table 4.1.12 Runoff Measurement Site

Runoff measurement by CWC			
No	**District**	**River/Site**	**Remarks**
1	Champhai	Tuivawl	Data available
2	Champhai	Ruantlang	Data pending
3	Aizawl	Tuival	
4	Aizawl	Tuichanlui	
5	Aizawl	Tuirini	
6	Aizawl	Tuiphal	
7	Serchhip	Tuichang	
8	Serchhip	Mat Valley	
9	Serchhip	Laolui	
10	Lawngtlai	Sihtiangpui	
11	Lunglei	Mat-Sekawi	
12	Lunglei	Tuipui 'D'	
Runoff measurement by PED			
13	Saiha	Ngengrual	Data available
14	Champhai	Tlawva	
15	Aizawl	Lamchhip	
16	Saiha	Kawlbem	
17	Serchhip	Tuikum	
18	Lunglei	Khawiva II	

Source: CWC and PED

Table 4.1.13 Hydropower Stations

No	Name of PS	Location	Capacity (kW)	Commissioning date
1	Serlui-A	Aizawl	1,000	24.04.1984
2	Khawiva	Lunglei	1,050	08.12.1988
3	Tuirivang	Muallungthu	300	14.08.1989
4	Tuipui	Champhai	500	15.12.1991
5	Maicham-I	N.Vanlaiphai	2,000	05.01.1996
6	Teirei	W.Phaileng	3,000	12.10.1999
7	Tuipanglui	Tuipang L	3,000	17.12.2004
8	KauTlabung	Thenhlum	3,000	05.05.2005
9	Lamsial	Farkawn	500	26.08.2008
10	Maicham-II	N.Vanlaiphai	3,000	11.11.2009
11	Serlui-B	Bilkhawthlir	12,000	30.04.2010
Existing total capacity			29,350	
12	Tuirial	Saipum	60,000	Expected in 2014-15

Source:PED

4.1.8 Disaster

(1) General

Mizoram is vulnerable to natural calamities like landslides, earthquakes, cyclones, flash floods and soil erosions. In 1992, massive landslides occurred in Mizoram, taking the lives of 166 people as well as damaging 14 houses. Earlier in 1983, 250 houses were damaged in Aizawl City alone. Landslide is, therefore, one of the major disasters in the state. The state is also prone to fire, earthquakes, high winds and cyclonic storms and drought. The state is in Seismic Zone V, which is the zone with highest risk for earthquakes.

The Disaster Management and Rehabilitation Department (DM&RD) is in charge of the disaster sector, and has prepared a vision for disaster management entitled the "Mizoram State Disaster Management Plan". Its vision is a holistic and proactive development of multi-disaster management and has a technology-driven disaster risk management strategy in the state. The plan includes: (i) vulnerability and risk assessment, (ii) resource inventory, (iii) preventive and mitigation measures, (iv) mainstreaming of disaster management, (v) preparedness measures, (vi) response plan, (vii) financial arrangement, (viii) contingency plan, and (ix) coordination mechanism.

(2) Vulnerability to Landslides

Mizoram, being on a hilly terrain, is prone to landslides. Every year, a number of landslides has usually been reported from various localities. These cause a lot of misery to the public, resulting in loss of life and property, disruption of communication network, and in general, bring about economic burden on the society. Landslide incidents are more prominent during the rainy/monsoon season as the soil structure gets softened by heavy and continuous downpours, especially with the high degree of slope. There can be many factors that make an area vulnerable to landslides, both induced by human activities as well as from the inherent natural composition of the soil. However, in most cases, the former is a contributing factor, especially in areas where development activities are higher and drainage facilities are neglected. As per records of the DM&RD, incidents of landslides from 2008 to 2011 are prominent in all districts of the state where it affects not only physical infrastructure but also human life, domestic animals and agricultural production as shown in Table 4.1.14.

The Remote Sensing Application Centre (MIRSAC) classified the whole area of the state into five zones in terms of landslide vulnerability as shown in Table 4.1.15 and Figure 4.1.6.

Table 4.1.14 Landslide Incident Statistics of Mizoram from 2008-2009 to 2010-2011

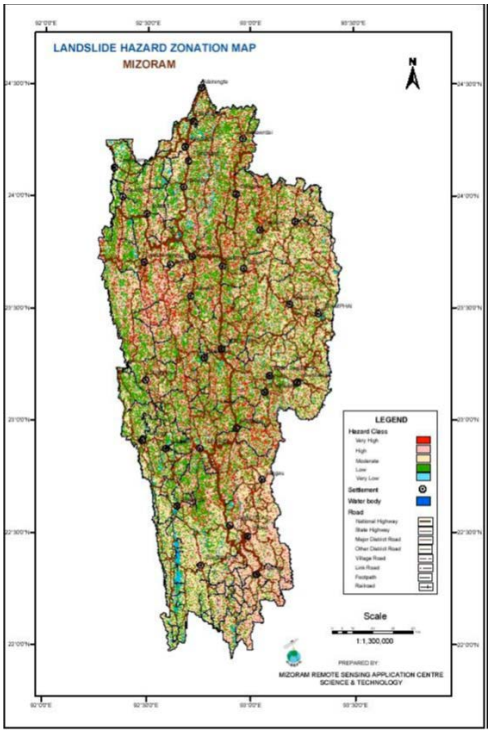
Year	2008-09	2009-10	2010-11
(1) District-wise Affected Village (nos.)			
Aizawl	186	167	167
Mamit	5	21	56
Kolasib	41	17	10
Serchhip	36	0	0
Champhai	103	62	103
Lunglei	25	17	1
Lawnglai	17	0	0
Saiha	44	15	20
Total	457	299	357
(2) Persons and Animal Affected (person / head)			
Person live lost	3	6	9
Person injured	24	7	17
Animal perished	0	0	5
(3) House damaged (nos.)			
Full damaged	159	74	244
Severely Damaged	142	113	792
Partially Damaged	408	841	3,814
Total	769	1,028	4,850
(4) Agriculture Affected			
Cropped area damaged (ha.)	950	1,355	1,194
Estimate crop loss (IRs crore)	17.3	22.4	31.3
Production affected (lakh tons)	6.5	1,050	5,212
(5) Damage to Infrastructure			
State road (km)	7		
District road (km)	7		
Municipal Road (km)	14		
Bridges (nos.)			3
Govt buildings (nos.)	4		7
School buildings (nos.)	28		6
Industries (nos.)	13		
Hospital (nos.)			2

Source : Disaster Management and Rehabilitation Department

Table 4.1.15 Landslide Hazard Zonation of Mizoram

LHZ code	Hazard Class	Area (km^2)	%
1	Very High	1,822	8.6
2	High	4,264	20.2
3	Moderate	8,903	42.2
4	Low	5,012	23.8
5	Very low	969	4.6
6	Water body	112	0.6
Total		21,081	100

Note: LHZ : Landslide Hazard Zonation
Source : Remote Sensing Application Centre (MIRSAC)



Source : Remote Sensing Application Centre (MIRSAC)

Figure 4.1.6 Landslide Hazard Zonation Map

(3) Vulnerability to Other Natural Calamities

(a) Earthquake

The state forms part of the most severe seismic zone in the country, namely Zone V of the Seismic Zoning Map of India that is referred to as Very High Damage Risk Zone. A large number of moderate- to large-magnitude earthquakes took place within the state boundary as well as within a 100-km radius around it. An earthquake of M 6.0 occurred in 1949 with its epicenter within 40 km of the state capital - Aizawl. Two large M 7.5 earthquakes occurred close to the state boundary, namely to the north in 1869 at only 20 km away and the other to the west of the southern tip within 70 km.

(b) Flood

The state, having hilly terrain, does not have a major flood problem. Under the action of heavy rains, flash floods may cause bank erosion and some local damage. Compared with other hazards like landslides and cyclones, the damage caused by floods within the state is the least. Notable incidents have been reported in Tlabung Town (Lunglei District) in July 2007 where 100 houses were submerged along the banks of the Khawthlangtuipui River on the Mizoram-Bangladesh border. The flooding also affected three adjoining chakma villages, where more than 80 families have to be evacuated. It was reported that the floods caused extensive damage to paddies and other crops close to these villages.

(c) Cyclones/Wind Storm

Insofar as wind hazard is concerned, the design wind speed in the whole state is 55 m/s (198 km/h), which is the highest value specified in the country, occasionally reached when cyclonic wind comes crossing Bangladesh. The devastation caused by cyclones/wind storms on human life, domestic animals, agriculture, houses and public infrastructure has been recorded more or less every year. The yearly trend of its effect does show a heavy toll on public life and infrastructure every year, especially to houses in the state.

4.2 Agricultural Production

4.2.1 Policy and Development Plan

(1) National Level

The Ministry of Agriculture (MOA), the Government of India, is the apex body for agricultural administration in India. The MOA consists of the four departments, (i) Department of Agriculture and Co-operation, (ii) Department of Agriculture Research and Education, and (iii) Department of Animal Husbandry, Dairying and Fisheries. A leading program of the MOA is a Special Additional Central Assistance Scheme, called Rashtriya Krishi Vikas Yojana (RKVY). The purpose behind this programme was to encourage States to draw up District and State Agricultural plans and also increase their own spending on the sector so as to reorient agricultural development strategies for rejuvenating Indian agriculture during the 11th Five Year Plan (2007/8-11/12). RKVY aimed to achieving 4% annual growth in the agriculture & allied sector during the 11th Plan period, by ensuring a holistic development in this sector. Its main objectives are to:

i) incentivize the states so as to increase public investment in agriculture and allied sector;
ii) provide flexibility and autonomy to the states in the process of planning and executing the schemes;
iii) ensure preparation of agriculture plans for the districts and states based on agro-climatic conditions, availability of technology and natural resources;
iv) ensure that the local needs / crops / priorities are better reflected in the agriculture plan of the state;
v) achieve the goal of reducing yield gaps in important crops through focused intervention;
vi) maximize returns to the farmers in agriculture and allied sector; and
vii) bring about qualifiable changes in the production and productivity of various components of agriculture and allied sectors by addressing them in a holistic manner.

Allocation for RKVY during the 11th Fiver-Year Plan was INR 250 Billion, and the actual expenditure was reported to be INR 212 Billion. RKVY is followed by 12th Fiver-Year Plan (2012/13-2016/17) with an allocated amount of INR 632 Billion.

(2) Agriculture Policy of Mizoram

A clearly defined agriculture policy is not found in the statements of Government of Mizoram. Instead the Department of Agriculture / Research and Education prepared a long term vision, named Vision 2020 Krishi Vigyan Kendras (KVKs) in July 2011. The Vision 2020 KVKs aims at backing up the North East Vision 2020, presenting a comprehensive sectoral development plan for the seven States in North East region of India including the Mizoram Sate, launched in May 2008. The agriculture sector in NE Vision 2020 envisages boosting up production of agricultural crops through large scale production of commercially viable crops so as to achieve self-sufficiency in food grains and raise economy of the region.

KVKs are institutions where grass root technology transfer and vocational training are practised for bridging gap between the available technology at one end and their application for increased production on the other. Mizoram has established KVK centres with a view to test, demonstrate and transfer technologies released from various research institutions. There are eight KVKs centres in Mizoram at the respective eight Districts. With this background, Vision 2020 KVKs was compiled in a form of collecting the District KVKs centres taking into account the local agricultural conditions. Vision 2020 KVKs shows the projected requirements and projected production of major agro-products in quantities; i.e. cereals, pulses, vegetables, fruits, oilseeds, fish, meat, milk, egg and oil palm in the years of 2012, 2017 and 2020. For achieving this targets, necessary actions for increased productivity, capacity building, human resources development and technical inputs are stated in the Vision 2020 KVKs, however specific approaches and measures are completely lacking. The establishment of state agriculture policy is an urgent issue for preparing adequate short and long term development plan of agriculture sector.

4.2.2 Overview of Organisation and Issues of Agro-allied Departments

There are eight agro-allied departments in Mizoram. These are Departments of (i) Agriculture (Crop Husbandry), (ii) Horticulture, (iii) Soil and Water Conservation, (iv) Agriculture (Research and Education), (v) Fishery, (vi) Animal Husbandry and Veterinary, (vii) Irrigation, and (viii) Sericulture. Of eight agro-allied departments, the former three departments are responsible for crop productions. There is a distinct demarcation of crops to be treated by the respective three departments. The Department of Agriculture (Crop Husbandry) is responsible for major food crops including cereals (rice, maize and wheat), pulses and oilseeds, and some industrial crops such as sugarcane and oil palm. The Department of Horticulture (DOH) is handling almost all horticulture crops including fruits, vegetables, flowers, etc. The Department of Soil and Water Conservation is in charge of several crops for forest and soil conservation such as rubber, coffee and blooming grass.

The Department of Agriculture (DOA) of Mizoram functioned as a full-fledged directorate since the inception of Union Territory in 1972, and had four cells of Crop Husbandry, Horticulture, Irrigation and Fishery. The fishery cell was separated from the DOA as the Fisheries Department in 1993, then followed by the DOA (Horticulture) in 1997, and Minor Irrigation Department (MID) in 2007. The Research and Education (R&E) Cell in DOA was established in 2001/02 and bifurcated from the DOA (CH) as the DOA (R&E) in 2007. The background for such departmental segmentation is not clear and beyond speculation, however, it may be unfavourable in terms of effective agro-administration and efficient use of human resources.

In addition, the DOA (CH) and the DOA (Horticulture) are demarcating the respective field territories, named 'Circle', at their own consideration, i.e. 57 Circles in DOA (CH) and 38 Circles in DOA (Horticulture). Both the circles do not coincide each other, and the basic agricultural information and data are collected on circles basis, as such this may hamper to make adequate agro-statistics and holistic development programme of agricultural production across the state. Both the departments are now intending to integrate different circles into the 26 rural development blocks (RD Blocks) which are administratively demarcated.

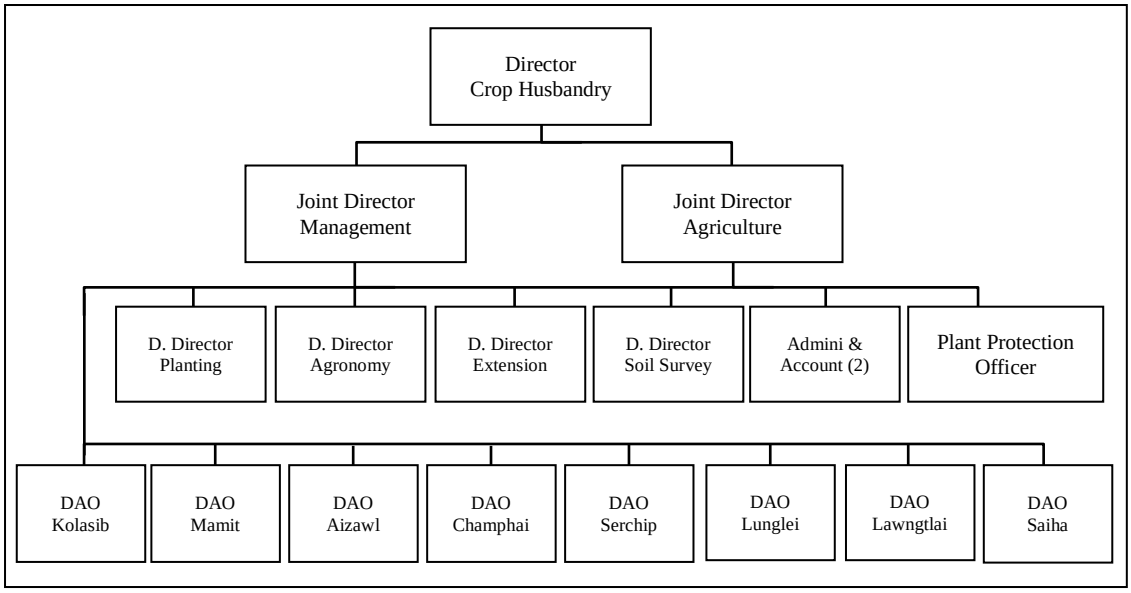
4.2.3 Department of Agriculture (Crop Husbandry and Research & Education)

(1) Roles and Organisation

The Department of Agriculture (DOA) consists of two directorates, Crop Husbandry (CH) and Research & Education (R&E), and each directorate is headed by the Director. The DOA (CH) takes a leading parts of agro-allied departments in Mizoram, and is responsible for all the activities for production of staple and food crops in particular. While, the DOA (R&E) is responsible to transfer improved agricultural technologies to the farmers through different schemes. The mandate of DOA to ensure food security in the Mizoram society through enhancing the production of rice, maize, pulses, oilseeds, etc. The basic role, activities, function and responsibilities of the DOA are to :

i) formulate and implement policies and programmes aimed at achieving rapid agricultural growth through optimum utilization of land, water, soil and plant resources;
ii) establish farmer-department coordination in implementing and providing technological know-how to the farming community through agricultural extension services;
iii) undertake all possible measures to ensure timely and adequate supply of quality inputs and services such as fertilizers, seeds, pesticides, agricultural implements, etc.;
iv) motivate farmers to minimize the use of pesticides and to control the environmental population with the adoption of Integrated Pest Management (IPM);
v) motivate farmers to diversify from traditional crops to commercial crops;
vi) monitor soil health and testing of nutrient level of soil samples collected from farmers' fields across the state;
vii) educate farmers on soil and water conservation technologies through implementation of Watershed Projects;
viii) undertake measures to provide agricultural credit, crop insurance and help the farmers in getting remunerative returns for their produce;
ix) conduct surveys for collection and maintenance of a wide range of statistical and economic data relating to agriculture, required for development planning; and

x) remove rural poverty, improvement of nutritional standards and quality of life of the rural people.

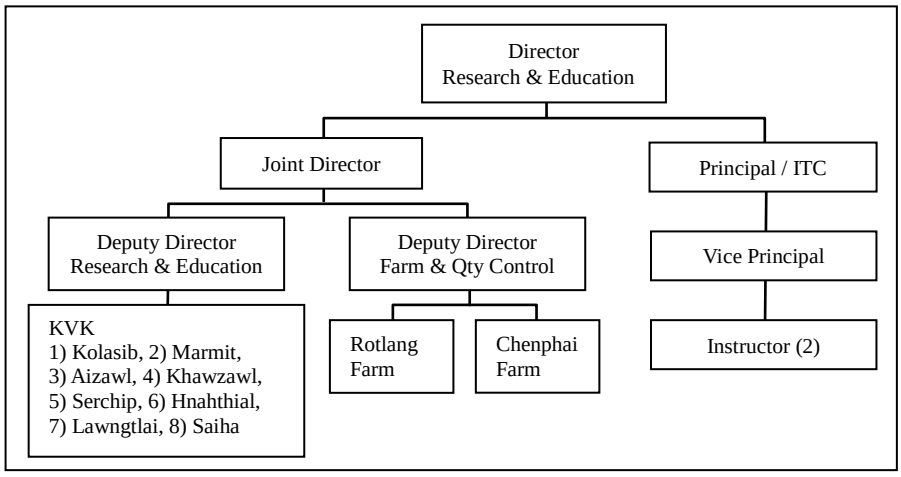


Source: DOA

Figure 4.2.1 Organisation Chart of Directorate of Crop Husbandry of DOA

The DOA (CH) led by a Director has six organisational cells headed by Deputy Directors, i.e. Administration, Account, Planning, Agronomy, Extension, Soil Survey and Plant Protection. The organization in the field level is hierarchically divided into eight agriculture districts, 13 agriculture sub divisions and 57 agriculture circles across the state. Organization chart of DOA (CH) is shown in Figure 4.2.1.

The DOA (R&E) led by a Director is organised by different institutions and agencies as shown in Figure 4.2.2. These are: i) Integrated Training Centre (ITC); ii) Krishi Vigyan Kendra (KVK); and iii) Farm and Quality Seeds Farms. The details of programmes and functions undertaken by the DOA (R&E) are described in the Section 4.4 "Agricultural Supporting Services".



Source: DOA

Figure 4.2.2 Organisation Chart of Directorate of Research & Education of DOA

(2) Staffing of DOA

The DOA is on of largest department in the Mizoram State having 725 services persons in total, consisting of 564 persons in DOA (CH) and 161 persons in DOA (R&E). The staff of DOA is further divided into two cells of DOA headquarter in Aizawl and District Offices. The DOA (CH) staffs 564 service persons in total, consisting of 192 persons in the Aizawl headquarter and 372 persons in the District offices as tabulated in Table 4.2.1, Table 4.2.2, Table 4.2.3, respectively. These staff number includes those of workers` level such as operators, drivers and office assistants. The actually servicing persons in administrative and engineering services are 230 in number in DOA(CH) with vacancy of 30 posts, and 106 persons in DOA (R&E). The academic background of major staff of both the CH and R&E are shown in Table 4.2.4.

Table 4.2.1 Staffing of DOA (CH) Headquarter in Aizawl

Name of Post	No. of Post	No. of Vacant
Director (Crop Husbandry)	1	Nil
Joint Director of Agri. (MMA)	1	Nil
Joint Director of Agriculture	1	Nil
District Agriculture Officer	8	Nil
Deputy Director	7	Nil
Subject Matter Specialist	3	Nil
Assistant Soil Chemist	1	Nil
Assistant Soil Survey Officer	2	Nil
Plant Protection Officer	1	Nil
Asst. Plant Protection Officer	1	Nil
Agri. Extension Officer	15	6
Asst. Agri. Inspector	4	2
Executive Engineer	1	Nil
Junior Engineer	4	Nil
Superintendent	1	Nil
Assistant Superintendent	3	Nil
Other Supporting Personnel	138	11
Total	192	19

Source: DOA

Table 4.2.2 Staffing of DOA (CH) at District Offices (as of Nov. 2013)

Name of Post	Mamit	Kolasib	Aizawl	Cham-phai	Serchhip	Lunglei	Laung-tlai	Saiha	Total	Vaca-nt
District Agri. Officer	1	1	1	1	1	1	1	1	8	Nil
Subject Matter Specialist	2	1	1	1	1	1	1	1	9	Nil
Sub Div. Agri. Officer	2	2	1	2	1	2		1	11	Nil
Agri. Extension Officer	8	4	11	5	3	9	4	4	48	8
Asst. Agri. Inspector	1	4	4	4	4	3			20	8
Gram Sevak	7	7	18	8	8	14	5	6	73	6
Junior Engineer	1	1	1						3	Nil
Head Assistant		1	1			1	1		4	Nil
Other Supporting Person	26	40	29	18	26	28	13	18	200	12
Total	48	62	66	39	44	58	24	31	372	34

Source: DOA

Table 4.2.3 Staffing of DOA (R&E) (as of Nov. 2013)

DOA (R&E) Headquarter in Aizawl

Position	No.	Vacancy
Director	1	0
Deputy Director (R&E)	1	0
Deputy Director (F&OS)	1	0
SMS (Research)	1	0
Superintendent	1	0
Agri. Extension Officer	1	0
Training Asst. (Home SC)	1	0
Assistant	2	0
Junior Engineer	1	0
UDC	3	0
LDC	7	0
Driver	1	0
6th Grade	4	0
Total	25	0

ITC Hnahthial

Position	No.	Vacancy
Principal ITC	1	0
Vice Principal	1	0
Instructor	5	0
Farm Supervisor	1	0
UDC	2	0
LDC	1	0
Driver	1	0
Carpenter	0	1
PTO	1	0
VFA	0	1
6th Grade	6	0
Total	19	2

Champhai Farm

Position	No.	Vacancy
AEO	2	0
GS	1	0
6th Grade	2	0
Total	5	0

KVK

Position	Mamit	Kolasib	Champai	Serchip	Lunglei	Laungtlai	Saiha	Total	Vacant
PC	1	1	1	1	1	1	1	7	0
SMS	6	6	6	6	6	6	6	42	0
PA	3	3	3	3	3	3	3	21	0
Superintendent	1	1	1	1	1	1	1	7	0
CO	1	1	1	1	1	1	1	7	0
Driver	2	2	2	2	2	2	2	14	0
6th Grade	2	2	2	2	2	2	2	14	0
Total	16	16	16	16	16	16	16	112	0

Source: DOA

Table 4.2.4 Academic Background of DOA (CH and R&E) Staff

Educational Level	Person in CH	Person in R&E
Ph.D	5	7
MSC	23	51
BSC	58	27

Source : DOA

(3) Development Plans for Agricultural Production

(a) Comprehensive District Agriculture Plan (C-DAP) and State Agriculture Plan (SAP)

From 11th Five Year Plan, the Department has prepared Comprehensive District Agriculture Plan (C-DAP) under Rashtriya Krishi Vikas Yojana (RKVY). The objective of district planning is to design an integrated and participatory action plan for the development of local area in general and agriculture and allied sectors in particular. With the slow growth in the agriculture and allied sectors in India, the GOI intended to provide incentive for State to draw up plans for agriculture sector more comprehensively, taking agro-climatic conditions, natural resource issues and technology into account, and integrating livestock, poultry and fisheries. The State Agriculture Plan (SAP) is prepared by integrating each C-DAP, and both plans are going to prepare once every 5 year along with Five Year Plan. Funding from RKVY to States was linked to formulation of C-DAPs. The major areas of focus of this plan are:

i) Integrated development of major food crops like paddy, coarse cereals, minor millets, pulses, oilseeds;
ii) Activities relating to enhancement of Horticultural Production and Popularization of Micro Irrigation Systems;
iii) Development of rain-fed farming systems in and outside watershed areas, and integrated development of watershed areas, watersheds and river valleys;
iv) Initiatives for use of Integrated Pest Management schemes, and activities related enhancement of soil health;
v) Strengthening of Infrastructure to promote Extension Services;
vi) Modern Methods of Cultivation and Agriculture mechanization;
vii) Sericulture, Animal Husbandry and Fisheries Development;
viii) Strengthening of Market Infrastructure and Marketing Development;
ix) Organic and bio-fertilizers; and
x) Possible Innovative schemes to encourage all sectors development.

The Mizoram State submitted the C-DAP for eight districts and the SAP to the GoI and the state was allocated the RKVY fund from 2010-11 until the end of 11th Fiver Year Olan with an amount of INR 4,687.5 lakhs utilising oil palm area extension, vegetable initiative in urban cluster, national mission on protein supplements, etc. The state continues to implement RKVY in the 12th Five Year Plan, amounting to INR 1,661.

(b) 12th Five Year Development Plan

The DOA proposed 12th five year development plan with the respective budgets for DOA (CH) and DOA (R&E) amounting to INR 22,337 lakhs and INR 2,500 lakhs. The major thrusts in the five year plan are; i) to create additional area of 18,000 ha for cultivation of WRC and hill slope terraces; and ii) to increase the productivities through provision of certified seeds, maintaining soil health, introducing high yielding varieties, promotion of farm mechanisation, etc. The schemes and outlays of DOA (CH) plan is shown in Table 4.2.5.

Table 4.2.5 Schemes and Outlays of DOA (CH) for 12th Five Year Development Plan

No.	Name of the Scheme	Activities	Physical Target	Outlay (INR lakhs)
1.	Administration			3,576
2.	Food Grain Development	Construction and maintenance of Potential Area Connectivity (PAC) Transportation of agriculture inputs etc.	8 km LS	1,110
3.	Agriculture farm and Quality Seed Production	Production of commercial seeds & certified seeds Demonstration for farmers & Training	2 nos.	55
4.	Manures & Fertilizers	Improvement of soil condition by providing slaked lime under National Food Security Mission (NFSM)		1,025
5.	Plan Protection	Implement plant protection chemicals & Bio-pesticide, IPM under NFSM		220

No.	Name of the Scheme	Activities	Physical Target	Outlay (INR lakhs)
6.	Commercial Crop Development	Implementation of Oil Palm Development programme under ISOPOM		4,010
7.	Oilseed Development	Development of oil palm cultivated area		50
8.	Pulses Development	Improving varieties and production under NFSM		50
9.	Extension & Farmers Training	Publication of periodicals such as agriculture leaflets, newsletters and advertisement etc. Purchase of Book / subscription of Agricultural journals State matching share for ATMA (9:1 Central & State sharing basis)	LS LS 8 Districts	595
10.	Crop Insurance	Implementation of new scheme of Rastriya Fasak Bima Karyakram (RFBK)		30
11.	Agricultural Machineries and Implements	Implement demonstration, training, farm machinery bank, promotion of farm mechanisation village, machine hiring centre under sub-mission on Agriculture Mechanisation		1,560
12.	State Soil Survey Organization	Semi / Detailed survey of WRC potential area using remote sensing and GIS technique		411
13.	Control of Shifting Cultivation	Implement under RAD, NLUP		3,501
14.	RKVY	Implementation of RKVY Stream I & II and sub-scheme like OPAE, RADP etc.		1,661
15.	New Land Use Policy (NLUP)	Implementation of NLUP	-	-
			Total	22,337

Source: DOA

(4) On-going Development Programmes

The DOA is undertaking various development programmes. The major programmes except NLUP are outlined below.

(a) Integrated Nutrient Management (INM)

The objectives of INM are to:

- promote INM through proper use of Fertilizers including secondary and micronutrients in conjunction with organic manures and bio-fertilizers;
- strengthen soil test facilities and provide appropriate recommendations to farmers; and
- upgrade the skill and knowledge of soil testing laboratory staffs, extension workers and strengthening their capacity.

Through setting up of new static and Mobile Soil Testing Laboratories to cover all eight districts, farmers can access these laboratories to confirm characteristics of their soil. Soil Health Card recording details of soil conditions with recommended fertilizers etc. is provided for farmers. Trainings and demonstration programmes are also implemented for farmers and government officers to promote INM. At present, one Static Soil Testing Laboratory is operating in Aizawl and three Mobile Soil Testing Laboratories covers all the eight Districts in Mizoram.

(b) Organic Farming Programme

The DOA introduced the organic farming programmes under the Macro Management Activity (MMA) of CSS since 2006. The organic farming programme is implemented coupled with contour trench system as a sustainable farming system in sloping areas. The activities being implemented in this programme are ;

- demonstrating and training on organic inputs such as EM (Effective Micro Organism), Bio-Dynamic, Vermi-compost and other Bio-fertilizers;

- training trainers for vermiculture technology for extension officers and field functionaries;
- Organising organic farmers group to obtain group certification on organic farming in 750 ha;
- establishing 37 numbers of vermiculture hatcheries by DOA to distribute Vermi-Mother Culture and Vermi-Compost to farmers;
- establishing fruits / vegetables wastes compost units at MIFFCO's park, Chhing chip and at Thingdawl Mode Organic Farm; and
- setting up small vermin-culture units for 786 farmers to promote vermin-compos, and purchasing their products at INR 12/kg as incentive programme.

(c) Watershed Development Programme in Shifting Cultivation Area (WDPSCA)

WDPSCA is a Special Central Assistance to State Plan Programme for the benefits of the sifting cultivator families in the North East States including Mizoram who are living below poverty line. The financing of the scheme includes treatment of arable and non-arable land, drainage line, creation of water bodies, development of agriculture, horticulture, plantation crops, forestry and household production system as package of rehabilitation components especially focused on natural resources management, poverty alleviation / household economic enhancement and eco friendly living system.

(d) National Watershed Development Project in Rainfed Areas (NWDPRA)

NWDPRA is a special central assistance programme for the benefit of farm families living below poverty line through treatment of arable and non-arable land, drainage line treatment, creation of water bodies, development of agriculture crops, forestry and household production system as packages of rehabilitation component suiting to the socio-economic condition. NWDPRA focus on the field activities for uplifting of the land use pattern of the area and development of land and water resources based on its guidelines.

(e) Oil Palm Development Programme Under ISOPOM

Ministry of Agriculture of GOI approved the programme of Oil Palm cultivation for the first time in Mizoram in 2004/05 under integrated scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) on 75:25 Central and State matching share. The scheme continued till 2010/11, and since 2011/12 the Oil Palm Area Expansion Programme (OPAE) has been continued under OPAE / RKVY (100% grant) funds of additional central assistance of GOI. In addition, NLUP also funded to this programme in order to involve its project. Along with this cultivation programme, the Oil Palm Act 2004 (regulation of production & processing) was passed in Mizoram Legislative Assembly on 2nd December 2004. The State Government tied up with three private companies for further oil palm development programme and signed MOU during 2005 to 2006, and GOI has provided support in the form of subsidy to the same 3 private companies for setting up of oil palm processing unit, finally sanctioned INR 75 million for 3 mills under OPAE / RKVY during 2011 - 2012, as shown in Table 4.2.6.

Table 4.2.6 Detail of Tied Up Companies for Oil Palm Development Programme

No.	Name of Company	Area Allotted under MOU	Location of Mills	Mill Capacity	Subsidy (INR mil)
1.	Godrej Agrovet Ltd.	Kolasib, Mamint	Bukvannei, Kolasib	5 t / hour	25
2.	3F Oil Palm Agrotech Pvt. Ltd	Aizawl, Serchhip, Saiha	Mat valley, Serchhip	5 t / hour	25
3.	Ruchi Soya Industries Ltd.	Lunglei, Lawngtlai	Rotlang Agriculture Farm, Lunglei	5 t / hour	25

Source: JICA Study Team

Expected outcomes form this programme are summarized as follows;

- Replacement of Jhum & citrus decline cultivation areas by Oil Palm cultivation with higher income generation from the Oil Palm Cultivation
- Discontinued shifting cultivation and start permanent and sustainable cultivation
- Provided employment opportunity for educated youth and higher income to the farmers
- Achieved self-sufficiency in edible oils by meeting market demand
- Achieved self-sufficiency in seed sprout requirement of NE States by setting up oil palm

seed garden

During 11th Plan an area of 9,537 ha was achieved in oil palm cultivation with an expenditure of INR 284 million in total till 2010/11.

(f) Promotion of Power Tiller & Mechanization Subsidy

To meet the demand of farm implements by the farmers in the state, the DOA adopted to procure machineries from approved and recommended firms under Macro-Management (CSS) 'Promotion of Farm Mechanisation'. The present availability of farm powers in the state is only 0.47 KW/ha which is much below national level. The scheme is expected to increase work efficiency and productivity of the farmers. Different kinds of machineries, water pump sets, power weeder, sprayers etc. and various other power driven equipment for tractor and power tillers etc. are provided to the farmers with permissible rates of subsidy as per GOI norms as shown in Table 4.2.7.

Table 4.2.7 Subsidy for Farm Machinery

No.	Items	Rate of Subsidy (INR)	Remarks
1.	Tractor	200,000	Regarding Tractors and Power Tillers better amount of Subsidy is floated to farmers by matching permissible rate of subsidy allowed by GoI with any available source of fund from State flagship programme like NLUP etc.
2.	Power Tiller	90,000	
3.	Water Pump Set	10,000	
4.	Power Weeder	15,000	
5.	Sugarcane Crusher	15,000	
6.	Knapsack Speyer	800	
7.	Manually Operated Implements	50%	
8.	Power Tiller Implements	10,000	
9.	Tractor Implements	10,000	
10.	Specialized Power Operated Implements	15,000	
11.	Self Propelled Paddy Reaper	40,000	
12.	75mm HDPE Pipes 4kg/cm2 6m long	50%	

Souce: DOA

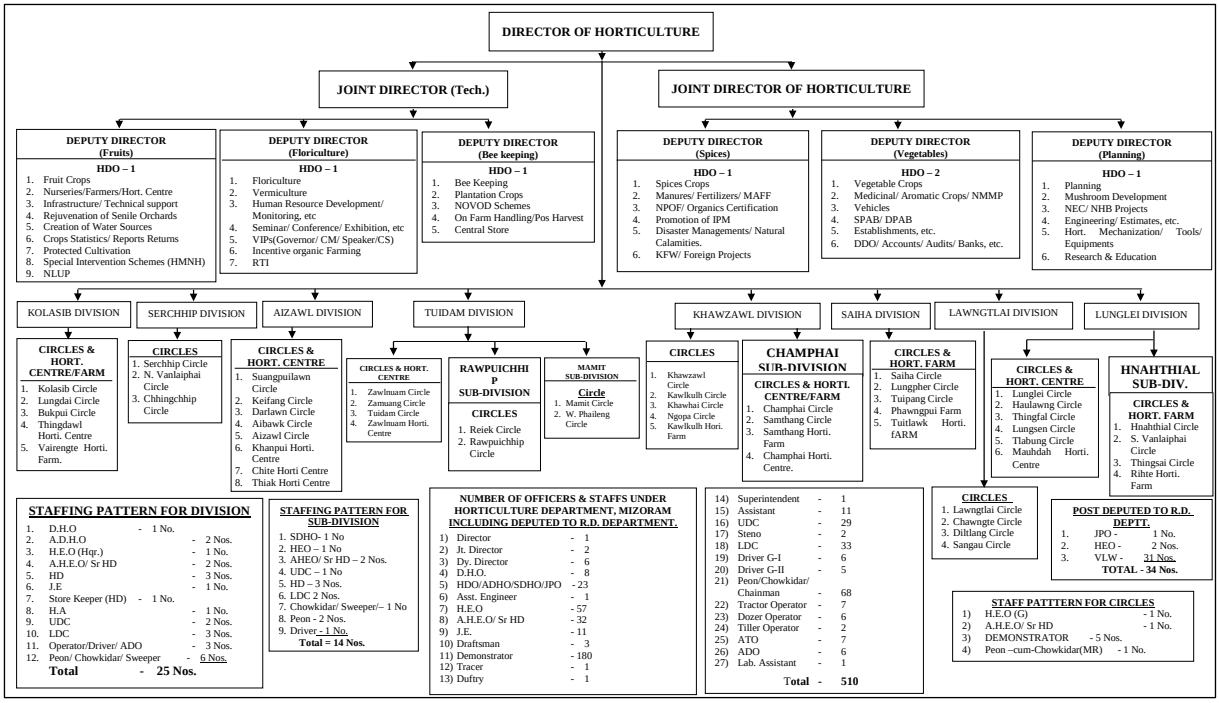
4.2.4 Department of Horticulture (DOH)

(1) Roles and Organisation

Department of Horticulture (DOH) was temporarily bifurcated from the Department of Agriculture (DOA) in 1993 with a small number of officers and staff. In 1997, it was transformed into a full fledged department. The mandate of DOH in agricultural and socio-economic development is to promote production of different horticulture crops including fruits, vegetables, spices, plantation crops, medicinal and aromatic plants of high economic value, taking an advantage of vertically variable climate. The climate in Mizoram also gives a favourable condition to grow flowers, and in particular two flowers i.e Anthurium and Rose are cultivated at commercial scale and known countrywide due to its large exports. The roles of DOH are specifically to:

i) change the existing Jhuming practices to permanent settlement of farming;
ii) uplift the economy of the farming community;
iii) increase the area, production and productivity of horticulture crops in the State;
iv) Impart the right packages of practices, new technologies etc. to farmers by training, awareness campaign, seminar, demonstration, workshop, etc.;
v) construct horticulture potential area connectivity in order to facilitate conveyance of farm inputs and out puts to and from the field; and
vi) provide quality planting materials, tools and implements, plant protection materials & equipment, pipes, water harvesting structures etc.

The DOH led by a Director has five sub-directorates according to the different types of horticulture crops such as fruits, flower, bee keeping, spices and vegetables, and one planning sub-directorate. The DOH deploys eight Division Offices in the respective Districts, and further 38 circles across the state. The organisation chart of DOH is shown in Figure 4.2.3.



Source: Department of Horticulture, Government of Mizoram

Figure 4.2.3 Organisation Chart of Department of Horticulture

(2) Staffing of DOA

The DOH staffs 433 services persons in total at present as shown in Table 4.2.8. This indicates the shortage of staff by 81 persons against the required post of 509 in number. In particular, staff shortage takes place in core posts for the extension works, i.e. 11 Horticulture Extension Officers (HEO) and 34 Horticulture Demonstrators. Table 4.2.9 shows the education level of the DOH main staff.

Table 4.2.8 Post-wise Staff Deployment of DOH

Name of Post	Nos. of Post		
	Sanctioned	Filled up	Vacancy
Director	1	1	
Jt. Director	2	2	
Dy. Director/DHO	14	14	
HDO/SDHO/ADHO	23	23	
HEO	7	46	11
AE	1	1	
Superintendent	1	1	
Extn. Officer (Bee Keeping)	1		1
JE	11	9	2
Draftman	3	3	
Assistant	11	8	3
Supporting Staff	383	320	64
TOTAL	509	433	81

Source: Department of Horticulture, Government of Mizoram

Table 4.2.9 Education Level of DOH Staff

Educational level	Staff number
PhD	1 (+ 2 results awaiting)
MSC	27
University/ College Graduate	25
High School Graduate	244
Total	**297**

Source: Department of Horticulture, Government of Mizoram

(3) 12th Five Year Plan

The DOH proposed 12th five year development plan with an amount of INR 6,000. Table 4.2.10 shows the major continuing schemes on horticulture development to be implemented in the 12th Plan Period (2012-2017), noting that the breakdown of outlay for the respective scheme is not disclosed.

Table 4.2.10 Major Schemes Proposed be DOH in the 12th Five Year Development Plan

Scheme	Contents/ Activities
Direction & Administration	・ Salary, Wages, Maintenance of existing building, Maintenance of vehicles, Construction of quarters
Horticulture. Farm & Quality Seed Production	・ Field contingencies for cultivation raising of seeds/ seedlings etc ・ Operation of Tissue Culture Laboratories, Chite ・ Establishment of nursery for production of quality planting materials

Scheme	Contents/ Activities
Manures & Fertilizers	・ Purchase of organic manures and fertilizers for distribution at 50% subsidy ・ Purchase of fertilizers, manures for Department use/ organic manures for incentive of organic farming ・ Purchase & supply of slaked lime for distribution at 50% subsidy ・ Micro nutrient water soluble fertilizers sale at 50% subsidy for drip irrigation
Plant Protection	・ Purchase of PP chemicals for distribution to the needy farmers & for emergency use ・ Purchase of PP equipment for distribution at 50% subsidy ・ Maintenance of Plant Health Clinic
Extension & Farmers Training	・ Maintenance of Horticulture Centres for demonstration training at Tuidam, Lunglei, Champhai, Thingdawl, and Chite ・ Exhibition, seminar/ farmers meet/ workshop at State and District level ・ Publication of Departmental magazine, booklets, leaflets, pamphlets & poster ・ Purchase/ subscription of book, journals, diaries etc. ・ Farmers training/ awareness campaign
Horticulture Engineering	・ Procurement of horticulture tools & implements for distribution 50% subsidy/ Department use ・ Purchase of polythene pipe for sale at 50% subsidy ・ Purchase of Shade net for sale at 50% subsidy ・ Purchase of UV film for distribution at 50% subsidy
Vegetable & Fruit Development	・ Fruit: Area expansion of fruit crops, Purchase and supply of seeds/ seedlings for sale at 50% subsidy ・ Vegetable: area expansion of vegetables and root & tuber crops, Promotion of protected cultivation (tomato& coloured capsicum) Purchase of vegetable seeds for distribution at 50% subsidy ・ Spice: Area expansion of spice crops, Purchase of spice seeds for distribution at 50% subsidy ・ Plantation: Provision of Arecanut seedlings for distribution to farmers, Subsidy to tea nursery owners ・ Flower: Provision of flower plants/ seeds/ bulbs etc. for distribution at 50% subsidy, Maintenance of VIP complexes including Directorate building & Top floor garden, Production of tissue plants & maintenance of tissue culture laboratory ・ Mushroom: Assistance for cultivation, Maintenance of mushroom laboratories including purchase of different material for production of spawn ・ Construction of horticulture link road ・ Rain water harvesting: Distribution of polyethylene water tank, Construction of foundation structure, Survey and Monitoring ・ Promotion of bee-keeping ・ Promotion of aromatic and medicinal plant
Horticulture Research & Education	・ Stipend/ book grant etc. ・ Research /trial on various horticulture crops

Source: Draft 12th Five Year Plan (2012-17) & Annual Plan 2012-2013, Planning & Programme Implementation Department, Government of Mizoram

(4) National Project/ Programme

The DOH is undertaking various Centrally Sponsored Schemes (CSS) as summarised in Table 4.2.11.

Table 4.2.11 National Projects/ Programmes for Horticulture Development in Mizoram

Title of Project/ Programme	Sponsored by	Period (Year to year)	Outline of Project/ Programme
RKVY schemes	CSS	2010-2013	The programme covered construction of rain water harvesting structure, stream water harvesting structure, marketing structure. Under this scheme NVIUC also included.
National Mission on Medicinal Plant & Aromatic Plants (NMMP) scheme	CSS	2011-2013	It included construction of model nursery public sector & private sector, cultivation of cinnamon, amla, aloe vera and stevia.
Horticulture Mission for North East & Himalayan States (HMNEH)	CSS	2010- 2013	To promote holistic growth of the horticulture sector through an area based regionally differentiated strategies for ensuring an end-to-end approach covering production, post-harvest management, processing and marketing to assure appropriate returns to growers/producers and promoting R&D technologies for production, post-harvest management and processing
Mission for Integrated Development of Horticulture	CSS	2014--till date	To promote holistic growth of horticulture. To encourage aggregation of farmers into farmer groups To enhance horticulture production, augment farmers, income and strengthen nutritional security To improve productivity by way of quality germplasm, planting materials and water use efficiency To support skill development and create employment generation opportunities
Natural Calamities	CSS	2010-2013	The programme offered shade net rolls for green house/ shade house as natural calamities.
National Mission on Micro	CSS	2010-till date	To increase the area under improved method of irrigation for better use efficacy to provide stimulus to agriculture growth

Title of Project/ Programme	Sponsored by	Period (Year to year)	Outline of Project/ Programme
Irrigation (NMMI)			

Source: Department of Horticulture, Government of Mizoram

In order to achieve the goal of various projects/ programmes, many and various activities are being performed by the DOH. Main activities are described in Table 4.2.12.

Table 4.2.12 Main Activities by the Department of Horticulture in Mizoram

Title	Activities
Mushroom Development	Development of Mushroom cultivation at Chite, Lunglei, Champhai, Thingdawl, Tuidam
Technology Mission Area Expansion Scheme	Promotion of fruit crops: banana, mandarin orange, grape, avocado, kiwi, passion fruit, papaya, pineapple, mango
Rejuvenation of Senile Orchards of Mandarin Orange	Covered 1460 hectares of orchards of mandarin orange
Creation of water resources (Community water tank and tube well)	Construction of community water tank, individual water tank and stream water harvesting structure
On farm water management	Establishment of drip and sprinkler irrigation
Protected cultivation	Construction of low cost green house, shade net, hi-tech green house, anti-birds, anti-hail net
Nursery	Promotion of small nursery (private), public sector nursery and tissue culture unit
Citrus Scion Bank	Establishment of citrus scion bank and infrastructure
Centre of Excellence for Horticulture	Establishment of Centre of Excellence for Horticulture
Floriculture	Provision of pre-fabricated green house, planting materials, net for plan support, nutrients, pruning secateurs, knapsack sprayer, Falcon rotary tiller, 3.10HP water pump with accessories, Tulu shiva series 1.10HP, Falcon pruning secateur (revolt)
Vegetable Development	Promotion of broccoli, okra, bitter gourd, sweet gourd, brinjal, carrot, cabbage, capsicum, chilli, tomato
Spices crops	Promotion of spices crops; turmeric, onion, coriander, bird's eye chilli, and distribution of Ozoneem, Dolomite, vermicompost, Neemkasto
Training & Horticultural Expo	Training on cultivation of mandarin orange, Hi-tech Agri. & Horti. Expo, construction of hi-tech greenhouse
Multipurpose Packing House	Establishment of Multipurpose packing house, horticulture centre, cold storage
Coconut Development Scheme	Distribution of coconut for planting
Others	Organic certification, vermiculture, bee keeping, plant protection and agriculture equipment, and provision of chemical and bio-pesticides

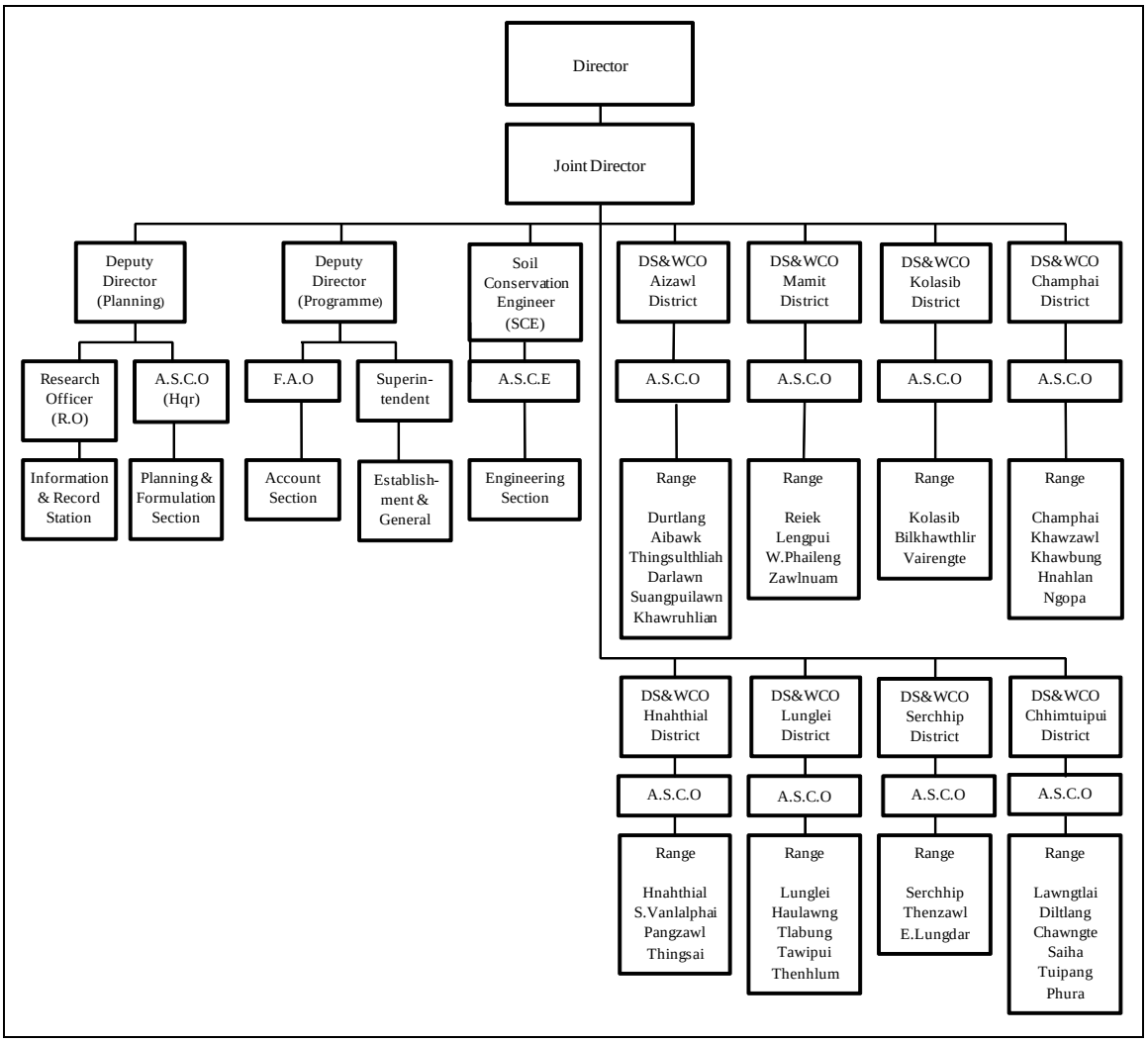
Source: Department of Horticulture, Government of Mizoram

4.2.5 Soil and Water Conservation Department (SWCD)

(1) Roles and Organisation

When Mizoram attained Union Territory status in 1972, Soil Conservation Department functioned under Director of Mizoram Forest Department and since 1977, Soil Conservation Department was put under Mizoram Agriculture Department. In 1985, the Soil and Water Conservation Department (SWCD) was formed as an independent agency, having main mandate to take care of soil and water conservation through efficient use of natural resources and protective afforestation / agroforestry programmes. In addition, the SWCD is responsible for the industrial crops production such as rubber, coffee, blooming grass, etc. which are deeply related to its main mandate.

The SWCD led by a Director has three sub-directorates in the headquarter and four field offices taking care of eight Districts as shown in Figure 4.2.4. The SWCD staffs 347 service persons in total, and those positions and deployment and their education level are shown in Table 4.2.13 and Table 4.2.14, respectively.



Source: Soil and Water Conservation Department, Government of Mizoram

Figure 4.2.4 Organisation Chart of Soil and Water Conservation Department

Table 4.2.13 Post-wise Staff Deployment of SWCD

Sl No	Name of Office	Director	Jt. Director	Dy. Director	S.C. Engineer	DSCO	Supt'd	ASCE	FAO	RO	ASCO	SCR	Asst. / HA	F.M	Support staff	TOTAL
1	Directorate	1	1	1	1		1	3	1	1	2	1	4	1	61	79
				1							2		2		20	25
2	Aizawl Dist.					1					1	3	1		45	51
												1			16	17
3	Lunglei					1					1	2	1		35	40
												3			14	17
4	Khawzawl					1						2			25	28
											1	2	1		12	16
5	Kolasib					1					1	1	1		25	29
												1			12	13
6	Serchhip					1					1	1	1		27	31
												2			13	15
7	Lawngtlai					1						2	1		23	27
											1	2			11	14
8	Mamit					1					1	1			30	33
												3	1		9	13
9	Hnahthial					1						1	1		26	29
											1	1			9	11
10	**Total of filled**	**1**	**1**	**1**	**1**	**8**	**1**	**3**	**1**	**1**	**7**	**14**	**10**	**1**	**297**	**347**
11	**Total of vacant**			**1**							**5**	**15**	**4**		**116**	**141**
	Total	**1**	**1**	**2**	**1**	**8**	**1**	**3**	**1**	**1**	**12**	**29**	**14**	**1**	**413**	**488**

Source: SWCD

(2) 12th Five Year Plan

The SWCD proposed 12th five year development plan with an amount of INR 5,000. Table 4.2.15 shows the major schemes on soil and water conservation works and promotion of concerned industrial crops to be implemented in the 12th Plan Period (2012-2017), noting that the breakdown of outlay for the respective scheme is not disclosed.

Table 4.2.14 Education Level of SWCD Staff

Education Level	Staff number
PhD	1
Msc	2
Engineer	3
M.A.	1
Bsc (Agri.)	5
Bsc (Chem)	1
University/College graduate	24
High school graduate	24
Total	**61**

ource: SWCD

Table 4.2.15 Major Schemes Proposed be SWCD in the 12th Five Year Development Plan

Scheme	Contents/ Activities
Direction & Administration	・ Salary, Wages, Medical treatment, traveling expenses, Training expenses, Office expenses, Publication etc.
Cash crop & Spices & Tree Development	・ Material & Supply: Poly bag, Netlon, coffee pulper ・ Cash Crop Plantation: Coffee, Rubber, Large Cardamom, Tea ・ Creation & Maintenance of Cash Crop Nurseries: Coffee, Rubber
Water Resources Construction & Development	・ Construction of water harvesting tanks/ ponds
Rural Area Development for Erosion Control in Jhum Lands	・ Set of logwood bunding in current Jhum
Run-off Retarding Scheme	・ Construction of inward terrace/ contour bunding
Soil Conservation Engineering Works	・ Gully plugging ・ Stream bank erosion control
Watershed Survey & Management	・ Survey consultation & preparation of project, Matching share of CSS like RVP etc.
Others	・ Construction and maintenance of building, construction and maintenance of approach road, Input supply (manure/ fertilizer, wire etc.)

Source: Draft 12th Five Year Plan (2012-17) & Annual Plan 2012-2013, Planning & Programme Implementation Department, Government of Mizoram

(3) On-going Projects and Programmes

The SWCD is undertaking various state and Centrally Sponsored Schemes (CSS) as summarised in Table 4.2.16.

Table 4.2.16 On-going Projects and Programmes on Soil and Water Conservation

Title	Sponsored by	Period	Outline of Project/Programme
Rubber Plantation	State	2012-2016	Rubber plantation as development scheme
Rubber Nursery	State/ NABARD Loan	2013-2017	Establishment of rubber nursery
RKVY	CSS	Year by year	Construction of check dam, water harvesting system, terracing, Stream bank erosion control, Agro-forestry activities etc. for enhancement of crop production and productivity
RVP/FPR	CSS	2000-	Construction of water harvesting system, check dam, Stream bank erosion control, Planting of cash crops

Note: RKVY Rashtriya Krishi Vikas Yojana, RVP/FPR Programme of Soil Conservation in the Catchment of River Valley Project and Flood Prone River, NABARD National Bank for Agriculture and Rural Development
Source: Soil and Water Conservation Department, Government of Mizoram Gross Products in Food Crops (under DOA)

4.2.6 Production of Food Crops (Under DOA)

(1) Overview of Rice Security in Mizoram

Prior to discussing the paddy cultivation and rice production, the historical and present facts on the provision of rice, the principal food grain in Mizoram, are clarified referring to the following Table 4.2.17 showing an overview of rice demand and supply in terms of personal consumption in Mizoram.

Table 4.2.17 Supply of Rice and Rice Self-sufficiency in Mizoram (2001/02 – 2010/11)

Detail	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Paddy Production (t)	105,715	109,205	114,630	107,661	107,740	42,091	15,688	68,917	66,132	67,428
(%)	**100**	103	108	102	102	40	15	65	63	**64**
PDS: Rice (t)	81,720	36,828	42,444	81,720	81,720	91,862	142,457	112,903	142,860	145,745
(%)	**100**	45	52	100	100	112	174	138	175	**178**
Self Sufficiency (%)	45.6	45.4	47.4	43.7	42.8	11.6	6	25.7	24.2	24.2
(%)	**100**	100	104	96	94	25	13	56	53	**53**
Population (no.)	888,573	921,013	925,703	944,865	964,438	984,430	1,004,851	1,025,710	1,047,017	1,068,781
(%)	**100**	104	104	106	109	111	113	115	118	**120**

PDS : Public Distribution System providing rice by the Government of India to supplement the lacking in Mizoram
Source: Statistical Abstract of Mizoram 2011

The agricultural production, rice in particular, suffered catastrophic damages, and its production drastically decreased by 60% to 80% in 2006/07 to 2007/08 owing to the Mautam. To rescue the serious distress close to famine in Mizoram, rice supply through PDS, Public Distribution System providing rice by the Government of India to supplement food shortage, sharply increased by more than 50% since the year 2007/08. The rice production has been gradually recovered after the Mautam although it remained at around 60% before the tragic. Nevertheless, the PDS rice still keeps the same supply level to date as that in 2007/08. Therefore, the self-sufficiency in rice production is kept as low as about 24%, corresponding to the half of about 45% before the Mautam.

From these facts, the JICA study team envisages that the framework of rice production system in Mizoram is unfavourably deviated from the self-sufficiency policy that the Mizoram government launches. Due to cheaper market price of PDS rice than those cropped in Mizoram, motivation for growing more rice, WRC in particular, may have been kept lesser. In terms of rice demand and supply, the present situation may be acceptable, however, it would have to be changed for maintaining adequate food security without relying much on external support, and accordingly for realising the sound financial management of the state government through saving fund against PDS.

(2) Rice

Rice is the principal food grain in Mizoram followed by maize, and wheat is rarely cultivated because it is consumed little in Mizoram. The paddy farming is practiced in two types, i.e. Jhum cultivation on the slope lands and WRC on the terraces. The total paddy production by both the farming was around 77,000 tonnes in 2011/12. During three year period from 2003-04 to 2005-06, the annual total production of paddy remained above 100,000 tonnes. However, in 2006-07 and 2007-08, paddy productions suddenly dropped due to the Mautam. In addition, widely multiplied other insects like Thangnang (tree bug) also caused extensive damage to crops. Even after five years from the Mautam, the recovery of paddy productions remains as low as by only 68% in 2012-13. The records of paddy production for the last ten years are shown in Table 4.2.18.

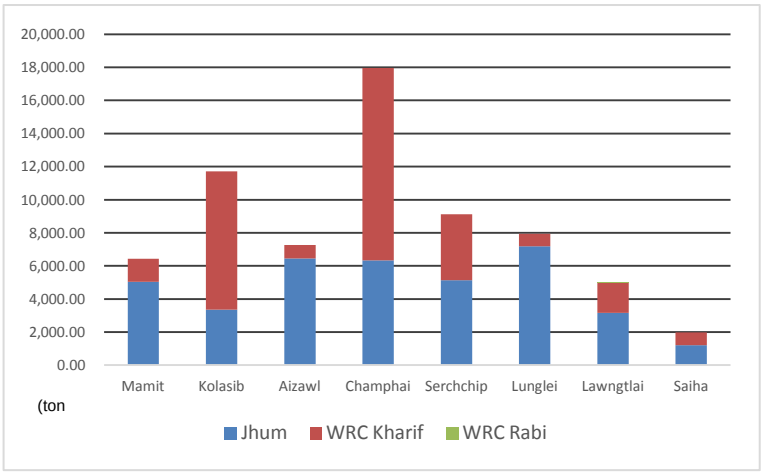
Table 4.2.18 Cultivation Area, Production and Productivity of Paddy (2003/04 – 2012/13)

Detail	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Paddy Jhum (ha)	43,447	40,969	40,100	41,459	44,947	40,792	36,841	28,562	25,826	25,437
(%)	**100**	94	92	95	103	94	85	66	59	**59**
Paddy Jhum (t)	72,181	64,420	63,100	13,935	11,355	44,489	43,985	37,854	38,064	35,032
(%)	**100**	89	87	19	16	62	61	52	53	**49**
Productivity (t/ha)	1.7	1.6	1.6	0.3	0.3	1.1	1.2	1.3	1.5	1.4
(%)	**100**	94	94	18	18	65	71	76	88	**82**
Paddy WRC (ha)	15,749	16,116	16,360	11,386	9,594	11,198	10,363	12,130	13,150	14,637
(%)	**100**	102	104	72	61	71	66	77	83	**93**
Paddy WRC (t)	42,449	43,240	44,640	15,806	4,333	24,428	22,147	29,575	37,502	42,438
(%)	**100**	102	105	37	10	58	52	70	88	**100**
Productivity (t/ha)	2.7	2.7	2.7	1.4	0.5	2.2	2.1	2.4	2.9	2.9
(%)	**100**	100	100	52	19	81	78	89	107	**107**
Total (ha)	59,196	57,085	56,460	52,845	54,541	51,990	47,204	40,692	38,976	40,074
(%)	**100**	96	95	89	92	88	80	69	66	**68**
Total (t)	114,630	107,660	107,740	29,741	15,688	68,917	66,132	67,429	75,566	77,470
(%)	**100**	94	94	26	14	60	58	59	66	**68**
Productivity (t/ha)	1.9	1.9	1.9	0.6	0.3	1.3	1.4	1.7	1.9	1.9
(%)	**100**	100	100	32	16	68	74	89	100	**100**

Source : Statistic Section of DOA

The above record reveals that Jhum cultivation area drastically decreased since 2009/10 for some reasons of the effect of NLUP partly but mainly of the Mahatma Gandhi National Rural Employment Scheme (MGNREGS) that provided a 100 day job a year for the rural poors. As for WRC, the productivity has almost recovered to the level before the Mautam, however the recovery of cultivation area is yet the previous level.

Figure 4.2.5 shows district-wise paddy productions in 2011-12. Champhai has the highest production areas produced 17,970 tonnes of paddy followed by Kolasib district produced 11,708 tonnes. Lunglei district produced the highest, 7,183 tonnes of paddy, in jhum cultivation. Very few Rabi cultivation at WRC areas were practiced in Lawngtlai and other districts.



Source: Statistic Section of Department of Agriculture, Government of Mizoram

Figure 4.2.5 District-wise Paddy Products in 2011-12

(3) Maize

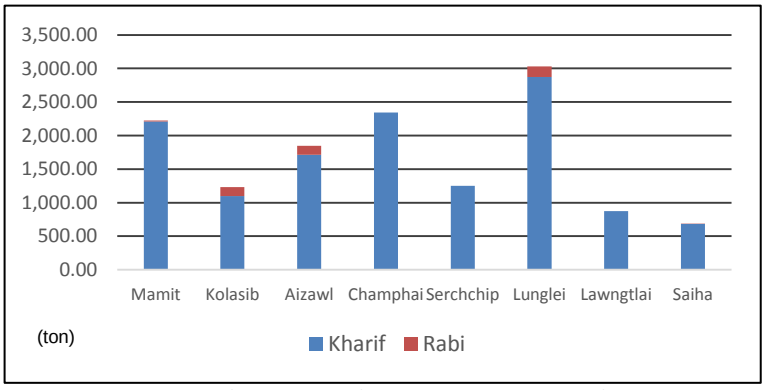
The production of maize in 2012-13 has decreased to around 40% comparing to the figure in 2003/04 as shown in Table 4.2.19 due to decreases of the cultivation area and productivity are to 59% and 68% of the 2003/04 level in spite of introduction of improved seeds by the department during the recent years. Maize also damaged by the Mautam, and its amount of products is not recovered fully to a level same as paddy.

Table 4.2.19 Cultivation Areas, Production and Productivity of Maize

Maize	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation area (ha)	10,481	10,505	11,742	10,775	7,328	9,558	8,551	9,005	6,905	6,175
(%)	**100**	100	112	103	70	91	82	86	66	**59**
Production (ton)	20,282	19,788	22,703	20,969	729	9,318	11,510	13,499	8,397	8,063
(%)	**100**	98	112	103	4	46	57	67	41	**40**
Productivity (ton/ha)	1.9	1.9	1.9	1.9	0.1	1	1.3	1.5	1.2	1.3
(%)	**100**	100	100	100	5	53	68	79	63	**68**

Source: Statistic Section of Department of Agriculture, Government of Mizoram

Figure 4.2.6 shows district-wise Maize productions in 2011-12. Maize is cultivated mainly in Kharif (rainy) season. Lunglei district shows the highest production, nearly 3,000 tonnes of Maize, followed by Champhai district produced about 2,300 tonnes. Farmers who cultivate maize in Rabi season are cultivating in their paddy land as a secondary crop, but such farmers are not much in Mizoram.



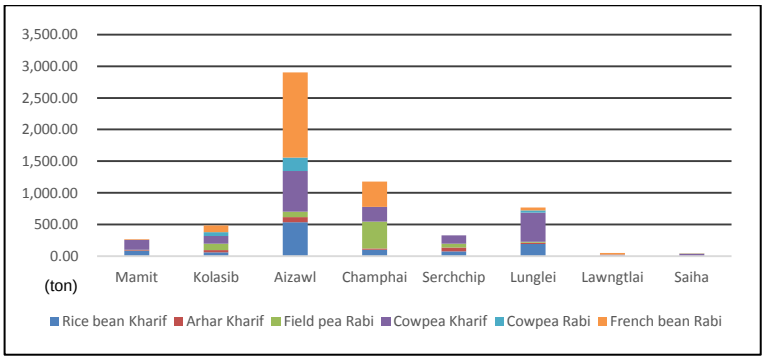
Source: Statistic Section of Department of Agriculture, Government of Mizoram

Figure 4.2.6 District-wise Maize Products in 2011-12

(4) Pulses and Oil Seeds

(a) Pulse

Pulses are the most important and staple food crops together with rice in Mizoram. The total products of pulses have been increasing since 2003/04. However, pulse cropping also could not avoid the Mautam damage, and both cultivation area and production recovered once but have been decreased during the recent four years. Instead, its productivity is being increased and stabilized.



Source: Statistic Section of Department of Agriculture

Figure 4.2.7 District-wise Pulses Products in 2011-12

Table 4.2.20 Cultivation Areas, Production and Productivity of Pulses

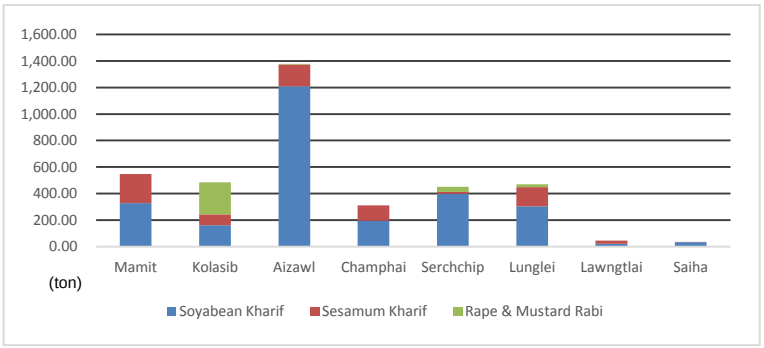
Pulses	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation Area (ha)	4,892	6,741	6,861	5,055	5,048	3,931	3,920	3,957	3,836	3,100
(%)	**100**	138	140	103	103	80	80	81	78	**63**
Production (ton)	4,313	7,971	8,663	5,833	2,632	3,646	6,479	6,065	5,331	3,288
(%)	**100**	185	201	135	61	85	150	141	124	**76**
Productivity (ton/ha)	0.9	1.2	1.3	1.2	0.5	0.9	1.7	1.5	1.4	1.1
(%)	**100**	133	144	133	56	100	189	167	156	**122**

Source: Statistic Section of Department of Agriculture, Government of Mizoram

District-wise annual products of pulses in 2011-12 are shown in Figure 4.2.7. Aizawl district is the highest products area of pulse, followed by Chmphai district. In case of pulses, 57% products of pulses were produced in Rabi season in Aizawl such as French beans, Cowpea and Field Pea. In case of Champai, 70% products of pulses were produced in Rabi. While almost oil seeds are growing in Kharif other than Rape & Mustard seeds. Langtlai and Saiha districts are showing negligible production of pulses.

(b) Oil Seeds

The total production of oilseeds in 2012-13 is 2,224 tons, of which amount of production is less than half to the each annual amount of products during 2003-04 to 2005-06 before the Mautam as shown in Table 4.2.21. Oil seeds show declining trends in products during recent years when compared with before rodent outbreak years though productivity has been increased. Cultivation areas of oil seeds have been decreased year by year and it is only 27% to the areas comparing to that of 2003/04 year level. Although the productivity has increased after the rodent outbreaks, the quantity of production has been decreased.



Source: Statistic Section of Department of Agriculture, Government of Mizoram

Figure 4.2.8 District-wise Oil seeds Products in 2011-12

Table 4.2.21 Cultivation Areas, Production and Productivity of Oil Seeds

Oil Seeds	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation Area (ha)	7,532	5,817	5,870	4,077	3,485	3,275	2,741	3,140	2,474	2,063
(%)	**100**	77	78	54	46	43	36	42	33	**27**
Production (ton)	5,478	5,321	5,560	3,757	748	2,514	2,988	3,727	2,382	2,224
(%)	**100**	97	101	69	14	46	55	68	43	**41**
Productivity (ton/ha)	0.7	0.9	0.9	0.9	0.2	0.8	1.1	1.2	1.0	1.1
(%)	**100**	129	129	129	29	114	157	171	143	**157**

Source: Statistic Section of Department of Agriculture, Government of Mizoram

While district-wise annual products of oil seeds in 2011-12 are showing in Figure 4.2.8. Aizawl district is the highest products area followed by Mamit district. While almost of all oil seeds are growing in Kharif other than Rabi & Mustard seeds. Laungtlai and Saiha districts are showing very less products of oil seeds.

4.2.7 Production of Horticulture Crops (under DOH)

(1) Production Data of Horticulture Crops Available

The JICA study team acquired production data of horticulture crops for the last five year period from the related government agencies. However, these data show a large fluctuation year by year that inexplicable as shown in Table 4.2.22.

It also seems that several data of production quantities were calculated by the multiplication of the cultivation area with the same yield per unit (such as Beans, Brinjal and Tomato), meaning that adequate yield survey might not have been carried out. Therefore, only the data of the latest cultivation area are used as the production data of horticulture crops in this report.

(2) Overview of Horticulture Crops Production

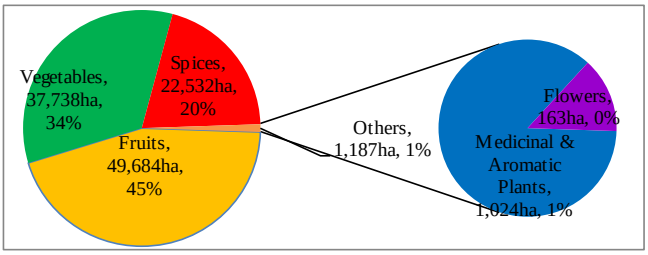
Of the cultivation area of horticulture crops in 2012 - 2013 in Mizoram, fruits occupy the largest area at 49,684 ha, 45% of the total, followed by 37,738 ha for vegetables (34%), and 22,532 ha for spices (20%), while medicinal/ aromatic plants and flowers occupy a mere 1,024 ha and 163 ha respectively as shown in Figure 4.2.9.

As for the district-wise cultivation area of overall horticulture crops, the northern part of the state - Aizawl, Serchhip, Kolasib and Champhai districts - has a relatively large cultivation area. While the southern part, including Lunglei, Lawngtlai and Saiha districts, has a relatively small area. In terms of the percentage of cultivation areas by crop type, fruits take the lead in all districts, and vegetables take second place in Aizawl, Serchhip and Lunglei districts, while in other districts spices are in second position. However, in any case there is no distinct variation as shown in Figure 4.2.10. The area surrounding Aizawl city and Serchhip town have a large area of production, while rural areas of Lunglei district, the northern part of Mamit district and the north-eastern part of Aizawl district have a relatively small area of production.

Table 4.2.22 Cultivation Area, Production and Productivity of Major Horticulture Crops in Mizoram

Crops		2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Banana	Area (ha)	7,220	8,660	10,040	10,090	10,540
	Production (ton)	66,424	84,810	118,600	119,060	127,530
	Productivity (ton/ha)	9.2	9.8	11.8	11.8	12.1
Local fruits	Area (ha)	-	-	-	8,840	9,040
	Production (ton)	-	-	-	19,310	19,890
	Productivity (ton/ha)	-	-	-	2.2	2.2
Mandarin Orange	Area (ha)	4,087	5,348	6,515	8,360	8,960
	Production (ton)	10,757	13,265	19,701	22,238	24,100
	Productivity (ton/ha)	2.6	2.5	3.0	2.7	2.7
Lime/ Lemon	Area (ha)	4,176	4,650	4,823	4,850	7,930
	Production (ton)	5,898	14,940	24,150	24,710	25,140
	Productivity (ton/ha)	1.4	3.2	5.0	5.1	3.2
Pineapple	Area (ha)	432	430	1,532	2,720	3,000
	Production (ton)	2,390	2,808	13,590	19,650	21,960
	Productivity (ton/ha)	5.5	6.5	8.9	7.2	7.3
Grape	Area (ha)	1,172	1,232	1,575	1,880	2,380
	Production (ton)	9,962	13,736	20,400	24,300	20,800
	Productivity (ton/ha)	8.5	11.1	13.0	12.9	8.7
Papaya	Area (ha)	817	770	800	850	1,000
	Production (ton)	4,493	4,985	6,750	18,190	23,100
	Productivity (ton/ha)	5.5	6.5	8.4	21.4	23.1
Chayote	Area (ha)	2,000	2,250	3,500	4,000	4,500
	Production (ton)	28,200	34,873	56,849	66,500	75,020
	Productivity (ton/ha)	14.1	15.5	16.2	16.6	16.7
Local vegetables	Area (ha)	-	-	-	10,220	11,460
	Production (ton)	-	-	-	8,380	9,620
	Productivity (ton/ha)	-	-	-	0.8	0.8
Bittergourd	Area (ha)	3,474	3,580	3,715	3,800	3,900
	Production (ton)	17,370	18,258	19,110	19,570	20,400
	Productivity (ton/ha)	5.0	5.1	5.1	5.2	5.2
Okra	Area (ha)	2,749	2,500	2,800	2,950	3,050
	Production (ton)	11,270	10,500	18,710	19,790	20,742
	Productivity (ton/ha)	4.1	4.2	6.7	6.7	6.8
Cabbage	Area (ha)	2,985	2,400	2,600	2,800	3,020
	Production (ton)	23,880	21,600	33,569	37,100	40,080
	Productivity (ton/ha)	8.0	9.0	12.9	13.3	13.3
Beans	Area (ha)	2,250	2,245	2,290	2,310	2,420
	Production (ton)	4,725	4,850	4,956	5,040	5,320
	Productivity (ton/ha)	2.1	2.2	2.2	2.2	2.2
Brinjal	Area (ha)	1,884	1,890	2,010	2,100	2,200
	Production (ton)	12,246	12,096	12,903	13,500	15,620
	Productivity (ton/ha)	6.5	6.4	6.4	6.4	7.1
Tomato	Area (ha)	620	635	675	700	800
	Production (ton)	4,960	5,715	6,180	6,420	7,390
	Productivity (ton/ha)	8.0	9.0	9.2	9.2	9.2
Chilli (fresh)	Area (ha)	7,185	8,700	8,700	-	-
	Production (ton)	24,429	47,850	47,850	-	-
	Productivity (ton/ha)	3.4	5.5	5.5	-	-
Chilli (dried)	Area (ha)	-	-	-	8,900	9,020
	Production (ton)	-	-	-	9,790	8,208
	Productivity (ton/ha)	-	-	-	1.1	0.9
Ginger	Area (ha)	9,391	6,200	6,500	7,010	7,280
	Production (ton)	34,290	31,000	31,950	34,460	28,390
	Productivity (ton/ha)	3.7	5.0	4.9	4.9	3.9
Turmeric	Area (ha)	9,625	4,500	4,780	5,580	6,050
	Production (ton)	39,862	22,500	23,970	29,240	22,990
	Productivity (ton/ha)	4.1	5.0	5.0	5.2	3.8

Source: Horticulture, Government of Mizoram

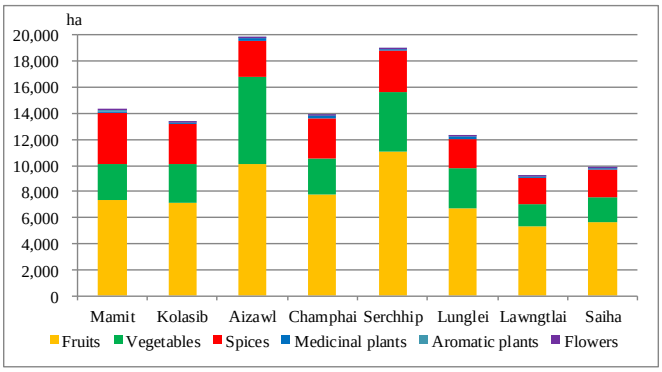


Source: Department of Horticulture

Figure 4.2.9 Cultivation Area of Horticulture Crops in Mizoram 2012-2013

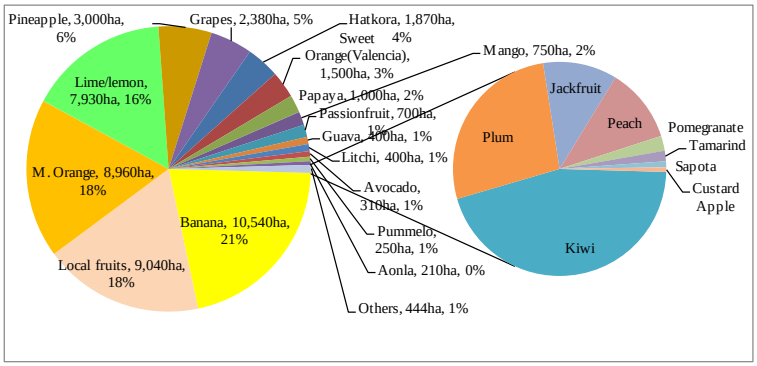
(3) Fruits

Of the cultivation area of fruits in the state, banana occupies the largest area, 21%, followed by local fruits such as mandarin orange, lime/ lemon, pineapple, grape, hatkora, sweet orange, papaya and mango (Figure 4.2.11). The sum of cultivation area of mandarin orange, lime/ lemon, hatkora and sweet orange occupies about 40% of the total, therefore it can be said that Mizoram is richly cultivated with citrus. As for the District-wise cultivation area of fruits (Figure 4.2.12), northern part of Serchhip district has the largest area for tropical fruits, and south-eastern part of Serchhip district and central-eastern part of Champhai district have a large area for temperate fruits. Major cultivation area of banana is northern part of Serchhip district. Large cultivation areas of other major fruits are; Mandarin orange: south-eastern part of Serchhip district and entire area of Kolasib district; Assam lemon: eastern part of Kolasib district and northern part of Saiha district; Pineapple: western part of Kolasib district and entire area of Saiha district, Grape; central- eastern part of Champhai district.



Source: Department of Horticulture

Figure 4.2.10 District-wise Cultivation Area of Horticulture Crops in Mizoram 2012-2013

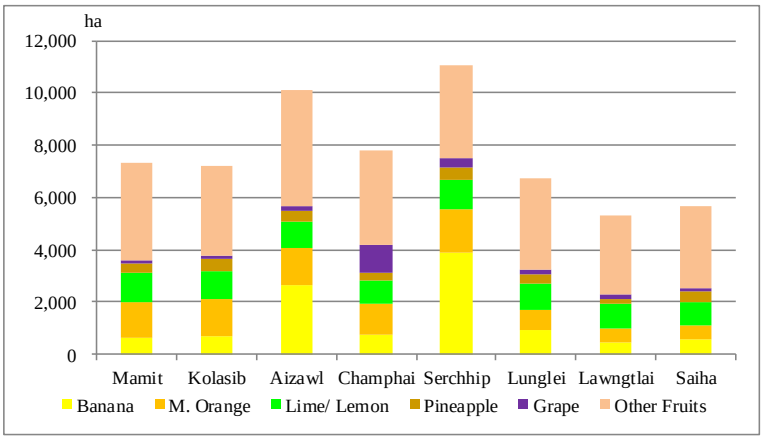


Source: Department of Horticulture

Figure 4.2.11 Cultivation Area of Fruits in Mizoram 2012-2013

(4) Vegetables

Of the cultivation area of vegetables in the state, local vegetables occupy the largest area, 30% of the total, followed by 12% for chayote (squash or chow chow), 10% for bitter gourd, 8% for okra, 8% for cabbage, 7% for cow pea, 6% for beans, 6 % for brinjal, 2% for tomato, and 2% for broccoli (Figure 4.2.13).

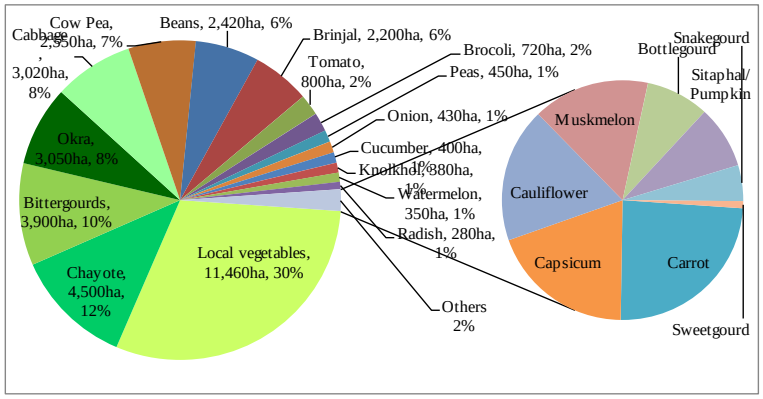


Source: Department of Horticulture

Figure 4.2.12 District-wise Cultivation Area of Fruits in Mizoram 2012-2013

Among the Districts, Aizawl district has a large area because of big demand in Aizawl city (Figure 4.2.14), followed by surrounding Serchhip town. North-eastern part of Aizawl district, southern part of Kolasib district and northern part of Saiha district also have a large cultivation area of vegetables.

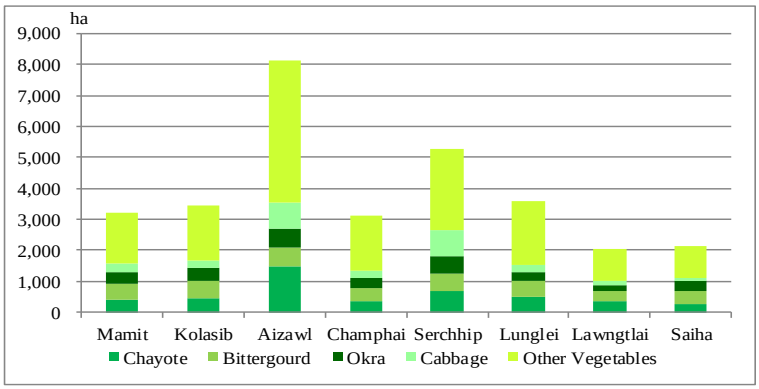
In the surrounding Aizawl city, the most major chayote cultivation area in the state, has the largest area of squash production, followed by southern part of Kolasib which has also a major cultivation area at Lungdai.



Source: Department of Horticulture

Figure 4.2.13 Cultivation Area of Vegetables in Mizoram 2012-2013

Bitter gourd is produced in the whole state, especially entire area of Kolasib district, circles surrounding Aizawl city and Serchhip town and northern part of Saiha district have a large area of production. Large cultivation areas of other major vegetables are as follows; Okra: western part of Kolasib district, the circle surrounding Aizawl city, north-western part of Aizawl district, the circle surrounding Serchhip town and entire area of Saiha district; Cabbage: the circle surrounding Serchhip town and north-western part of Aizawl district; Brinjal: north-western part of Kolasib district, circles surrounding Aizawl city and Serchhip town and central-eastern part of Champhai district; Tomato: the circle surrounding Aizawl city; Broccoli: the circle surrounding Aizawl city and northern part of Saiha district.



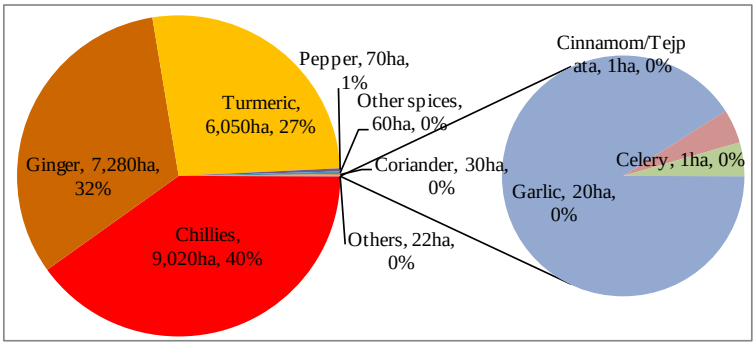
Source: Department of Horticulture

Figure 4.2.14 District-wise Cultivation Area of Vegetables in Mizoram 2012-2013

(5) Spices

Of the cultivation area of spices in the state, chilli occupies the largest area, 40% of the total, followed by 32% for ginger, and 27% for turmeric, and those three crops occupy most of

the cultivation area of spices (Figure 4.2.15). As for the district-wise cultivation area of spices, Mamit district has a relatively large area, however, overall difference between the districts is small (Figure 4.2.16).

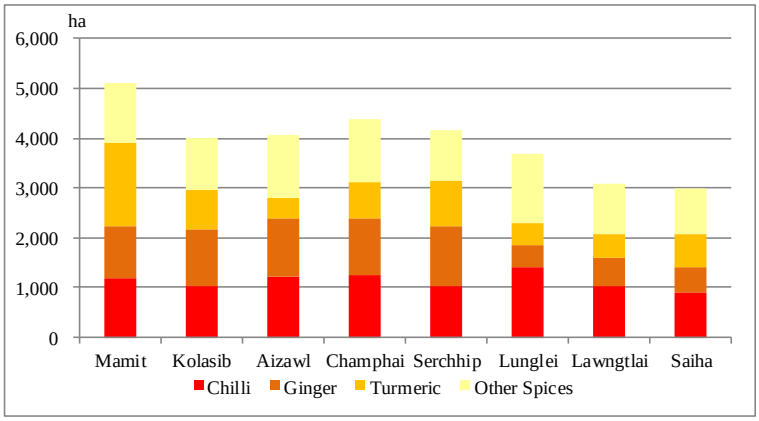


Source: Department of Horticulture

Figure 4.2.15 Cultivation Area of Spices in Mizoram for the year 2012-2013

(6) Arecanut

Arecanut is cultivated in low altitude areas, especially western part of Kolasib district is a major cultivation. Western part of Mamit district has also a large area of arecanut production.



Source: Department of Horticulture

Figure 4.2.16 District-wise Cultivation Area of Spices in Mizoram 2012-2013

4.2.8 Production of Industrial and Other Crops

The major industrial and other crops cultivated in Mizoram are sugarcane, oil palm (both of them under DOA), rubber, coffee and bloomgrass (under SWCD). For the latter three crops, no production data are available in the government agencies. The SWCD is involved only in the distribution of those seeds and nurseries under the NLUP. In addition, the local agencies of both the national rubber and national coffee boards do not keep any data and records on those production. Therefore, two crops of sugarcane and oil palm are discussed in this sub-section.

(1) Sugarcane

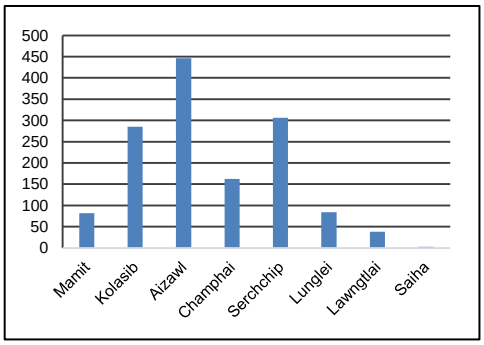
The production of sugarcane has been fluctuated. The highest production was recorded in 2005-06 and quantity of the production was 45,953 tonnes. While in 2012-13, the amount of product decreased to 6,795 tonnes as shown in Table 4.2.23. Cultivation area has not been decreased much during the past decade except the period of the Mautam damage. The productivity is extremely low, and those processed sugar is either self-consumed by farmers or sold on the street venders. There are no improvement observed in recent years in spite of implementation of Sugarcane development programme by the NLUP.

Table 4.2.23 Cultivation Areas, Production and Productivity of Sugarcane

Sugarcane	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation Area (ha)	1,393	1,357	1,383	1,340	883	1,342	1,434	1,418	1,463	1,322
(%)	**100**	97	99	96	63	96	103	102	105	**95**
Production (ton)	36,174	13,565	45,953	12,187	828	13,696	12,368	7,901	7,456	6,795
(%)	**100**	37	127	34	2	38	34	22	21	**19**
Productivity (ton/ha)	26.0	10.0	33.2	9.1	0.9	10.2	8.6	5.6	5.1	5.1
(%)	**100**	38	128	35	3	39	33	22	20	**20**

Source: Statistic Section of Department of Agriculture, Government of Mizoram

Figure 4.2.17shows district-wise products of sugarcane in 2011/12. Aizawl districts show the highest product of 446 tonnes followed by Serchip district produced 306 tonnes. Production of in southern area is minimal.



Source: DOA

Figure 4.2.17 District –wise Sugarcane Products in 2011-12

(2) Oil palm

Oil Palm Development Programme was initiated from the year 2004-2005 in Mizoram under a scheme named Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM). However some newly planted oil palm trees were cut down by farmers because of absence of the marketing facilities at the initial stage. The Government of Mizoram has signed MOU with reliable national companies for oil palm development and processing. Since 2008, companies have bought oil palm at INR 4.75/ kg, and 1,828 tonnes of oil palm has been purchased by companies as shown in Table 4.2.24.

Total area covered under oil palm till 2012-13 is 13,056 ha with 5,623 famers for 6 districts except Champhai and Saiha districts, as shown in Table 4.2.25. In 2013-14, another 5,000 ha is expected to be developed. A high level Working Group constituted by Government of India has identified a potential of 101,000 ha for Oil Palm cultivation in Mizoram. The implementing partner companies with areas are showing in Table 4.2.26. After agreements will be settled with these companies the production of oil palm will be increased.

Table 4.2.24 Record of Fresh Fruit Bunches Purchased by Companies

Year	Godrej Oil Palm Ltd		Ruchi Soya Industries Ltd.	
	Q'ty (tonne)	Amount (INR)	Q'ty (tonne)	Amount (INR)
2010	46.722	63,702	-	-
2011	450.896	2,141,757	26.26	124,735
2012	1,259.231	5,981,347	44.829	212,937
Total	1,757.899	8,286,806	71.089	337,672

Source: DOA

Table 4.2.25 Cultivation Areas of Oil Palm

Year	Kolasib	Mamit	Lunglei	Lawngtlai	Serchhip	Aizawl	Total
2005-06	82	-	28	-	-	-	110
2006-07	24	-	-	-	-	-	24
2007-08	543	267	15	-	-	-	825
2008-09	964	476	218	-	42	-	1,700
2009-10	997	697	806	-	342	-	2,842
2010-11	489	474	500	105	310	-	1,878
2011-12	478	350	562	300	250	26	1,966
2012-13	1,039	928	750	617	327	50	3,711
Total	**4,616**	**3,192**	**2,879**	**1,022**	**1,271**	**76**	**13,056**

Source: DOA

Table 4.2.26 Oil Palm Processing & Development Companies in Mizoram

Company	Site	Progress
Godrej Oil Palm Ltd.	Bukvannei, Kolasib District	80 % of Civil work is completed. Tentative Commissioning by November, 2013.
Ruchi Soya Industries Ltd.	Rotlang Agrill. Farm, Lunglei District	Land Lease cleared, Lease Deed signed. All other clearance obtained. Foundation stone laid on 19.2.2013. Tripartite agreement signed. Commissioning expected in May,2015.
3Fs Oil Palm Agrotech Ltd.	Mat Valley, Serchhip District.	Private land leased. Clearance of MPIB , MPCB obtained.

Source: DOA Farming Systems and Cropping Method

4.2.9 Farming System and Cropping Method

(1) Cultivation Seasons for Paddy and Other Food Crops

Season		RABI			KHARIF						RABI		
Paddy	Jhum												Rain
	Steep S.												550
	V Flat.												
	V. Irrig.												450
	V. Irrig.												
Maize	Jhum												350
	Upland												
Pulse	J or Up												250
	Upland												
Oil Seed	J or Up												150
	Upland												
Sugar cane	Upland												50
	Upland												
Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(mm)
Ave. Rainfall: mm		11	16	59	162	361	460	415	430	360	192	44	5	
Climate		Cold		Mild	Hot						Mild		Hot	

Note: Steep S.- Steep Slop Land, V. Flat.- Valley Flat Land (No Irrigation), V. Irrg.- Valley Irrigated Flat Land, J or Up- Jhum or Upland

Source: JICA Study Team

Figure 4.2.18 Cropping Pattern of Food Crops in Mizoram

Most of the farmers in Mizoram are practicing traditionally integrated farming system like mixed cropping as well as piggery and poultry farming in villages to increase or continue their income from different sources, and above all it is risk-adverse farming and cropping systems. Based on the traditional farming system, a good scientific and appropriate knowledge and technology for smooth running of integrated farm are indispensable to increase farmer's income and production of the state.

Relation with rainfall (monsoon) and cropping pattern of paddy and other food crops of maize, pulse, oil seeds and sugarcane are showing following Figure 4.2.18. There are two cropping seasons in India as well as Mizoram, Kharif (rainy season / Mizoram: 'Fur') and Rabi (Dry season / Mizoram 'Thai'). Mizoram's Kharif starts in the end of March or April earlier than other place of India.

In addition, the farming is broadly divided three cultivation type in Mizoram as follows;

(a) Jhum Cultivation

The forested fallow is slashed and cleared during December to January. The burning of slash is done in March. Rice is sown mostly from April to the middle of May after the first rain. Both early and late matured varieties are adopted in the same land. Accordingly, there are two harvesting time during July to August, and during October to November. Traditional terrace / slope cultivation is also almost same cropping pattern with Jhum cultivation. Maize and other crops are also sown during April to May as the mixed crops with paddy or without paddy. After harvesting once, the land is abandoned and remains fallow for few years until the next cultivation.

(b) Wet Rice Cultivation (WRC) / Low (valley) Land Rice cultivation

Cultivation method of irrigated and non-irrigated are almost the same in WRC. Paddy is transplanted from June to July, and harvested from October to November. Mixed cropping is not practised in WRC. Double cropping is possible if irrigation water is fully available, but it has not been practiced much.

(c) Rabi Cultivation

The sowing time of Rabi cultivation is September to October and harvesting time is February to March. The area under Rabi cultivation of paddy is only 1% to 5% of Kharif. The sowing time of Maize, pulse and oil seeds etc. are September to November and harvesting time is January to March.

(2) Cereals (rice, maize, wheat) (under DOA)

(a) Rice

The rice farming system in Mizoram is generally categorized into the following four types:

Table 4.2.27 Type of Paddy Cultivation

Type of Paddy Cultivation	Land Location	Type of Paddy	Cropping Method
i) Direct seeded, rain fed in upland (Jhum)	Steep slope / Slope	Upland-rice / Sticky	Mixed cropping
ii) Direct seeded rain fed on level bench terraces	Medium slope	Upland-rice / Sticky	Mixed cropping
iii) Transplanted on wet terraces (WRC)	Gentle slope/Flat	Wet-rice / Sticky	Mono cropping
iv) Transplanted in valley lands (WRC /Rabi)	Flat	Wet-rice / Both	Mono cropping

Source: JICA Study Team

Paddy and maize are cultivated as the main food crops mixed with variable crops such as other cereals, vegetables and pulses except transplanted paddy in wet terrace or flat lands (WRC). WRC is entirely depending on the monsoon rain except few cases. In Jhum farming, tilling on the hills is entirely done by hand or no tilling is practised, hence, no mechanical tools are used in Jhum and slope upland cultivation. Tractors and power tillers have been used in recent years in flat land in valleys mainly in Kolasib, Mamit and Champhai districts. There is traditional gender role in agricultural work, for example, weeding and seed storage are made by women, land protection and marketing are by men, and clearing forest, burning, sowing and harvesting are by women and/or men.

Recently, resource conservation technologies such as the System of Rice Intensification (SRI) that save water and reduce the use of chemical fertilizers while maintaining higher crop production are being promoted under the Crop Development Schemes, but still in trial stage.

The landrace paddies preferable to Mizoram farmers are of Japonica sticky types mainly grown in Jhum and upland paddy cultivation. While WRC is practised on the flatter land in the valleys or terraces, and some famers are using improved or hybrid Indica varieties recommended by the DOA. Many farmers obtain traditional paddy seeds from adjoining state of Manipur or Myanmar as palatable and staple food for their consumption. Apparently there is a gap between farmers' choice and DOA's recommended varieties.

Transplanted Valley Land - WRC

Paddy mixed with other crops

Source: JICA Study Team

Photo 4.2.1 Paddy Cultivation

While, the DOA is intending to increase amount of production toward self-sufficiency of rice along with government policy. There are about 96 landrace / indigenous varieties so far identified, and 13 varieties are developed and identified by the Indian Council of Agriculture Research (ICAR) research complex in Mizoram. Table 4.2.28 shows rice varieties for rain-fed upland cultivation in Mizoram.

Table 4.2.28 Varieties for Rain-fed Upland Rice

Variety	Duration type (days)	Grain	Feature	Average Yeild (ton/ha)
Kayalni 11	62	LB	Intermediate tall	2.0
Heera	68	LB	Resistant to GM, blast	3.0
Sattari	75	SB	Early maturing mutant	3.0
Kalinga 11	85	LB	Intermediate tall	3.5
Vanaprabha	85	LS	Intermediate tall	3.0
Neela	90	LS	Resistant to GM, blast,BPH	3.0
Poorva	90	MB	Fine grain	3.0
Subhadra	90	LS	Drought tolerant	3.0
8Tara	100	LB	Resistant to GM, GLH	3.5
Annada	105	SB	High yielding	4.0
Govind	110	LS	Tolerant to BLB, blast, BS	4.0
TTB 4-7	115	LB		4.0

Source: Status Paper on Rice in North East India

(b) Maize

Many local landrace varieties are utilized by farmers. The following varieties are proved to be high yielding ones, however, farmers are hardly given enough quantity of improved seeds at a proper time.

- Improved seed of Shakti, RCM 11 & 13 and QPM & cross hybrids of Vivek 9, Vivek 21 (QPM would be utilized as quality feed for pig)
- Hybrids seed of HQPM for seed production

(3) Pulses

The major pulses growing in Mizoram are cow pea, french bean, mung bean, field pea, rice bean and pigeon pea. Local landrace varieties are prevailing and seed replacing practice is minimal because of the poor distribution of improved seeds. The DOA is engaged in seed distribution, however the quantity of seeds is not enough to improve productivities. There is no private seed company except small dealers in Aizawl.

Pulses are cultivated in both Kharif and Rabi seasons as mixed crops in Jhum and upland fields along with major crops without application of chemical fertilizers and pesticide. In settled cultivation, mixed and inter cropping are usually practised with vegetables or major cereals. Most of the pulse are sown by line sowing or broadcasting, and the cropping methods and cultivation extent are usually decided depend on marketing conditions. A small number of farmers are cultivating pulse as the secondary crop of paddy field in the winter season in Kolasib and Marmit district.

(4) Oilseeds

Among the oil seed crops, mustard, rapeseeds and sesame are predominant oilseed crops widely cultivated in Jhum and upland fields. Several varieties of sesame are mixed and growing with other crops in Jhum land by traditional method. Mustard and rapeseed are generally cultivated mixing with Rabi crops like barley and gram. These crops are mainly cultivated for commercial purpose. Extracted oil is used for their self-consumption and for sale at local market. The mustard is sometime taking as an intercrop with autumn planted sugarcane in which no additional land is required also offers scope to augment mustard production without adversely affecting the yield of companion crop of sugarcane. Soya bean is also growing as intercrop with maize, fruits or vegetables. It needs proper amount of rainfall that is provided by the monsoon during the sowing seasons of the crop. In addition, the rapeseed / mustard crops act as a very good cover of soil in winters.

Table 4.2.29 Major Varieties of Fruits in Mizoram

Crops	Varieties
Mandarin Orange	Zo- Mandarin, Michal, Tangerine seedless, Washington, honey orange
Sweet Orange	Valencia
Banana	Tall Cavendish, Grand Naine
Papaya	Red Lady, Red Royal, local
Passion fruit	Yellow, Purple
Pineapple	Giant Kew, queen Mauritius
Mango	Amrapali, Local
Dragon Fruit	Red, White

Source: Department of Horticulture, Government of Mizoram

(5) Sugarcane

Traditional varieties are prevailing and its growing period is 10 to 12 months (for improved varieties 9 to 10 months). The DOA is taking up organic cultivation system recently. Almost all the harvested sugarcane are used for making Jaggery / gur (brown sugar lump) in the villages because sugar mill is not available in Mizoram. Some yields of Kolasib are selling for traders of Assam. Planting time of sugarcane is March to April and September to October.

(6) Fruits

With the exception of local fruits, fruit trees such as bananas, pineapples, citruses and grapes are generally mono-cropped in the orchards. These fruit trees are often planted with vegetables in the irrigated areas and river terraces where vegetables can be grown even during dry season. Bananas and pineapples are also planted in Jhum field (no-longer jhuming). In those fields, soil losses are very severe and countermeasures for soil conservation must be taken immediately. Terracing and pit

planting are introduced in the orchards where small scale irrigation systems are constructed with an assistance from the DOH, however, those orchards are very few in number.

Fruit trees and orchards are usually poorly managed. Appropriate training and pruning, fruit thinning and regeneration of fruit trees are not practised. On the other hand, orchards where weeding is frequently practised are often observed, however, weeds pulled up are not utilized for organic manure, and cover crops are not cultivated. Varieties of major fruits cultivated in Mizoram are listed in Table 4.2.29.

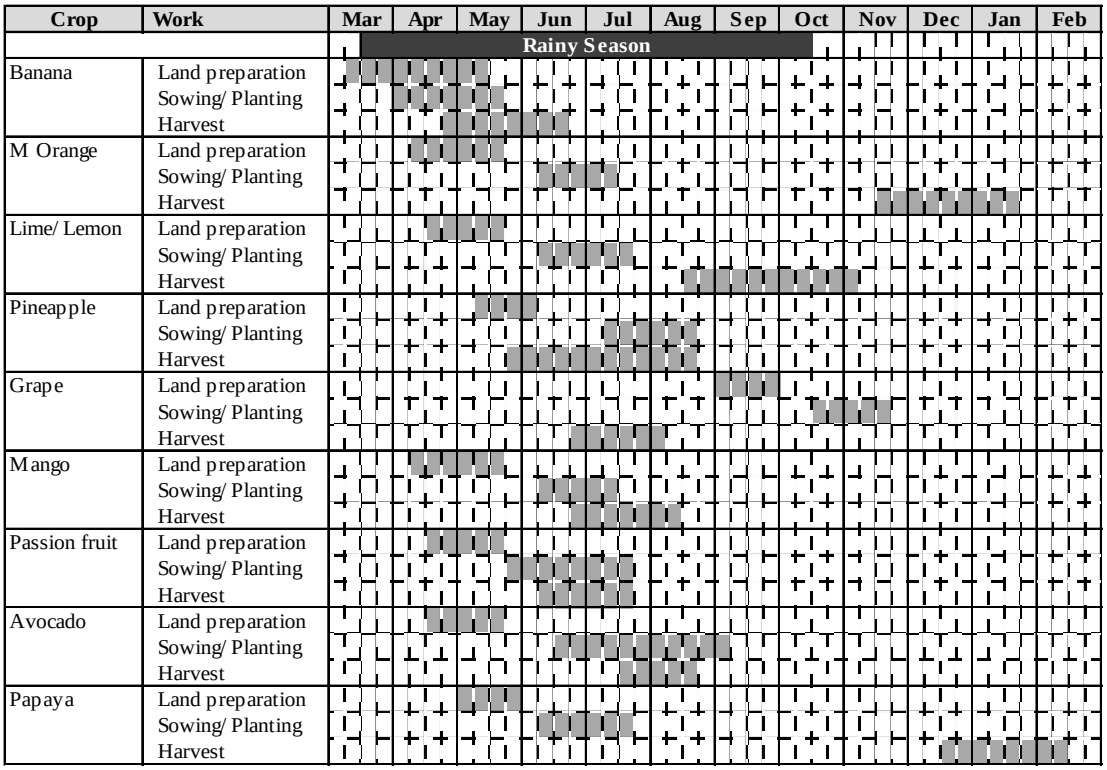
Fruit trees are planted at the time when condition of soil moisture becomes good during the early part of rainy season. Crop calendar of major fruit trees is described in Figure 4.2.19.

Banana cultivation in Jhum field

Orange orchard in Lunglei

Vineyard in Champhai

Photo 4.2.2 Cultivation of Fruits in Mizoram



Source: Department of Horticulture, Government of Mizoram

Figure 4.2.19 Crop Calendar of Major Fruits

(7) Vegetables and Spices

In Jhum fields, various vegetables and spices such as pumpkins, brinjals, african eggplants, wax gourds, leaf mustards, chillies and gingers are cropped mixing with paddy. Fertilisers are not applied, and direct seeding is practised. Most of seeds are being saved by farmer, however, ginger seeds are occasionally distributed by the DOH. Most of vegetables are consumed at home. Meanwhile, chillies and gingers are cultivated for sale because they are highly profitable crops in Mizoram. Especially gingers are mono-cropped in some Jhum fields at the first year and beyond, however, appropriate measures for land conservation are not practised, and soil losses at the harvesting time become a major issue.

In sub-urban areas in Aizawl and other large towns, irrigated fields for vegetable production are expanding. Water from stream is collected by using subsidised water pipes and storage tanks. However, discharge of stream flow is extremely low, and dripping water among rocks is used for irrigation when some streams are dried up during the driest period. In these areas, terraces for vegetable cultivation are constructed by farmers, and stone retaining wall are also set in the steep slope fields. In general, leguminous crops, pumpkins, maize and squashes (perennial crop) are grown during rainy season, and peas and cruciferous vegetables such as leaf mustards, cabbages and broccolis are cultivated during the dry season.

Greenhouses are also being promoted by the DOH mainly in these areas, then vegetables which are difficult to cultivate during rainy season, such as tomato and broccoli, can be produced even during the rainy season, and vegetable seedlings for the dry season can be grown during the late period of the rainy season. In addition, dairy cows are being introduced with an assistance from the state government, and farmers who keep cows apply cow dung to the fields. Farmers who have no animal purchase and apply cow or chicken dungs and neem compost for soil improvement. Only a few farmers have procured subsidised mini-power tillers for land preparation at the terrace fields.

Vegetables are also cultivated at the fields on river terraces in Sairang in Aizawl district, Hortoki in Kolasib district, Ngengpui in Lawngtlai district and so on. However, vegetable cannot be cultivated during flood period, three to five months from May to September. Vegetables can be grown without irrigation system even during dry season, because high soil moisture is retained and moisture is supplemented by early-morning mist. Fertilisers are not applied because soil fertility is kept by flood.

In wet rice cultivation areas, vegetables such as peas and leaf mustards are cultivated during the dry season if irrigation water is available.

Open-pollinated vegetables are cultivated under Jhum farming, while hybrid vegetables are mainly cultivated under greenhouses or under irrigation systems. Major varieties of vegetables cultivated in Mizoram are described in Table 4.2.30.

Most vegetables and spices are cultivated mainly in Jhum fields during rainy season. Meanwhile, soft green vegetables such as cabbages and broccolis are mainly cultivated during the dry season under irrigation, because it is difficult to cultivate them during the rainy season due to diseases caused by fungi and bacteria. Crop calendar of major vegetables and spices is described in Figure 4.2.20.

Table 4.2.30 Major Varieties of Vegetables in Mizoram

Crops	Varieties
Open-pollinated varieties	
French Bean	Vaishnavi, Local
Cowpea	Bali, Local
Pumpkin	Lalkumra, Local,
Hybrid varieties	
Broccoli	Fantayasy F1, Premiere
Cabbage	Ryozeki, Indam 1299, scarlet Red, Fieldman, KK689 F1
Tomato	Samrudhi F1
Okra (Bhindi)	Money maker, BSS-593, Shehzadi
Brinjal	Abhinav, BSS-633
Bitter gourd	Sheena, BSS-618
Carrot	Chilka, Pusa Kesar, Improved Kuroda
Coriander	Woggiano, Caribe, X-47 Improved
Onion	Red Gold, Preana
Pakchoy	Kanti F1
Chillies	Shimran, Evergreen, Clause HP 158, BSS-367 Arjun, BSS-776
Capsicum	Angel F1, Asha F1, Surekha/ BSS-555
Lettuce	Baltimoral, Garishma
Knol-Khol	Winner F1 Hybrid
Pumpkin	Arjun F1

Source: Department of Horticulture, Government of Mizoram

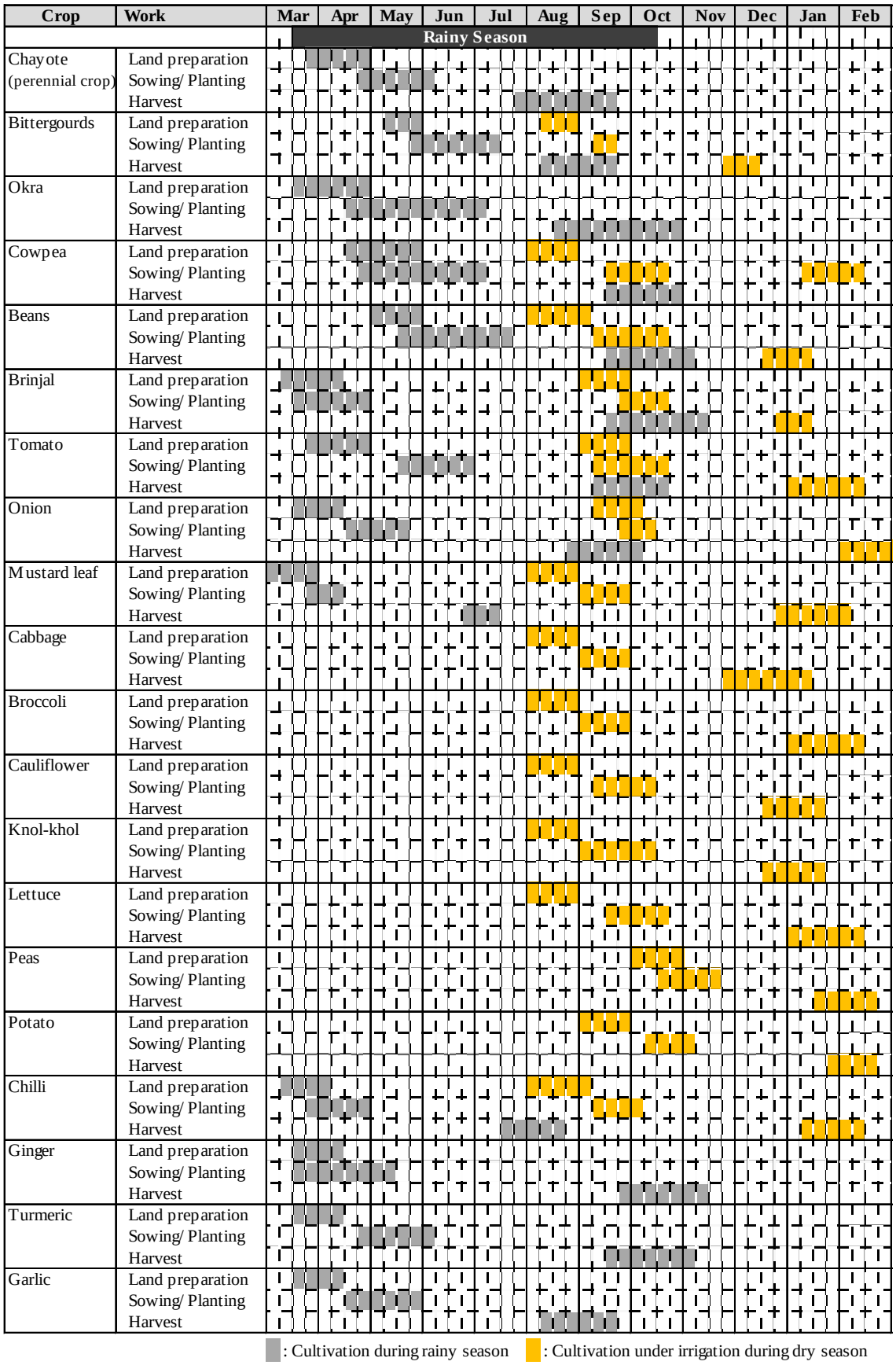
Vegetable cultivation in suburban area

Vegetable cultivation on river terrace

Tomato cultivation under greenhouse

Source: JICA Study Team

Photo 4.2.3 Cultivation of Vegetables in Mizoram



Source: Department of Horticulture, Government of Mizoram

Figure 4.2.20 Crop Calendar of Major Vegetables and Spices

(8) Flowers

After 2000, several exotic flowers not common in the state earlier such as anthurium, bird of paradise, leather leaf fern, rose (Dutch varieties), dendrobium orchids, lilium, chrysanthemun, carnation and gerbera have been imported and introduced by the DOH, then commercial production of flowers were started. Especially, anthurium and rose have grown to the exporting business in a form of cut flowers to the other states in India. It had a positive impact that ZOPAR Exports Private Ltd. based in Bangalore expanded their business to Mizoram. ZOPAR has produced cut flower in their own greenhouses, and has signed with flower growers to increase production of cut flowers. Anthurium growers have formed a Society named Zo Anthurium Growers' Society (ZAGS), which operate smoothly to take care of marketing of all the cut flowers they produced. Members of ZAGS initially contracted with ZOPAR to sell all their products, however, they have now developed their own market channels. The ZAGS are composed of about 200 farmer members, of which 90% are women. Flowers are produced mainly in the surrounding area of Aizawl city, Kolasib city and partly in Lunglei. The production scale in area is still as small as about 160 ha in total, of which 46 ha in Aizawl, 35 ha in Kolasib and 21 ha in Lunglei.

Anthurium and rose are cultivated year round under shade houses and greenhouses respectively, which were constructed on terracing with assistance from the DOH. Seedlings have also been provided by the DOH, however, new varieties have now been introduced by some growers themselves. Cut flowers are shipped after grading and packing. Varieties of major commercial flowers cultivated in Mizoram are described in Table 4.2.31.

Table 4.2.31 Major Varieties of Flowers in Mizoram

Crops	Varieties
Anthurium	Tropical, Fire, Yang
Rose	Gold Strike, Peach, Avalanche, Corvette, Bonear, Taj Mahal, Avalanche, Bordeaux
Mokara Orchid	Nora Blue 'Pink', Dinah Shore, Om Yai, Thailand Sunspot, Nora Blue 'Purple'
Gerbera	Stanza, Brilliance, Pre-Intenzz, Jaffana, Walhalla, Balance, Paradisco

Source: Department of Horticulture, Government of Mizoram

Flower cultivation under shade house

Grading of anthurium

Packaging of cut flower

Source : JICA Study Team

Photo 4.2.3 Cultivation and Shipping of Flower

(9) Industrial and Other Crops

(a) Oil palm

Oil Palm is still new crop for farmers in Mizoram. Variety of Tenera is the ruling hybrid and it is a cross between thick-shelled Dura and shell less Pisifera. Best season for planting is June-December i.e., during monsoon. In case of planting during summer, adequate irrigation, mulching and growing cover crops like sun hemp is preferred in practice. Oil palm is a wide spaced perennial crop with a long juvenile period of three years. Inter and intra row space can be used to generate income during the juvenile phase of the crop. At present, Mizoram farmers are planting paddy, banana, pine apple, ginger, chillies, cucurbits, cowpea, beans, mustard, maize, soya bean etc. with palm oil.

(b) Rubber

The clones recommended by the Rubber Board of India for the North East areas are RRIM 600 & RRII 105. These clones have been introduced to Mizoram under NLUP. This is also a mono cropping

system except in the first 2 to 3 years after planting during which period certain crops like paddy, pineapple, banana, vegetables, pulses etc can be planted along with rubber. From the 4th year onwards canopy of rubber trees will close and other crops cannot be grown economically. It grows well at the elevation below 450m above sea level where such low lying areas are mostly in districts of Kolasib, Mamit, Lunglei and Lawngtlai.Coffee (under DSWC)

(c) Coffee

Since Robusta Coffee production is comparatively high in the country at lower elevation and a large portion of Mizoram State is in the higher elevated ranges, the Coffee Board of India recommended Arabica coffee for Mizoram. Since the past few years, Arabica coffee of Sln 12 (Cauvery) variety had been introduced till today. It has been practised as monocropping under good shade trees on the elevation ranging 1,000m to 1,500m above sea level.

(d) Bloom

This belongs to the grass family and grows anywhere in the state as natural vegetation. Literature on broom cultivation is extremely few and no set principle of package and practices of its cultivation is found till today. In Mizoram, there are three types of broom; Phiahpui, Phiahfang and Phiahthir. The inflorescence of Phiahpui is larger than the other two and is therefore more profitable for planters. Generally, Phiahpui is more at the lower elevation areas whereas Phiahfang and Phiahthir are more in the higher elevated areas.

Due to its tuff root system, broom plants have a good soil binding property and acts as a good soil conservation measure for top soil, the green leaves serves as a good source of fodder too while the stem after harvest can be used as fossil fuel/fire wood.

(10) Farming Practice Known from Household Survey

According to the results of household survey carried out by the JICA study team, 95% of Jhum land is cultivated with mixed cropping methods. More than 50% of other types than Jhum area are also cultivating with mixed cropping methods as shown in Table 4.2.32. In any case, since the distance from their residence to own fields is about 4 km long, almost all farmers are staying at on-site hats constructed in their each field for farming works during weekdays and return to residence at every weekend.

Source : JICA Study Team

Photo 4.2.4 A hut staying for work during weekdays

Table 4.2.32 Farming Practice Known from Household Survey

Cultivation Types	Mono-cropping		Mixed-cropping		Inter-cropping		Total		Ave. Distance from Residence to Fields
	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(km)
Shifting Cultivation	40	4	956	95	9	1	1005	100	4.43
Settled Rainfed Cultivation	59	38	91	58	5	3	156	100	4.62
Settled Irrigated Cultivation	9	47	10	53	0	0	19	100	4.06
Fruits and Industrial Crop	112	49	115	50	2	1	228	100	3.01
Total	**220**	**16**	**1172**	**83**	**16**	**1**	**1408**	**100**	**4.27**

Source: Household Survey December 2013 - January 2014, JICA Study Team

(11) Diversification of Crops

Table 4.2.33is showing percentage of gross cropped area of 1990-91 and 2008-09 of which cropped area is categorised into three crop groups as food crop, commercial crop and horticulture & plantation.

In addition, data of four states of North East region are also presented in this table to compare Mizoram's status. During 1990-91, food crops were dominated in every states, and it is observed a significant change with diversification from traditional food crops to commercial crops or horticulture & plantation crops except Assam. From this perspective, diversification pattern of Mizoram is horticulture / plantation crop based agricultural diversification, and it means that diversification of other crops are limited. Crop diversification, which is supposed to have more remuneration and certain benefits for farmers.

Table 4.2.33 Percentage Change in Area under Crop Categories

State	1990 – 91: Gross Cropped Area			2008 – 09: Gross Cropped Area		
	Food Crops (%)	Commercial Crops (%)	Horticulture & Plantation (%)	Food Crops (%)	Commercial Crops (%)	Horticulture & Plantation (%)
Assam	69.87	10.78	8.33	66.65	7.11	9.11
Manipur	91.53	3.44	16.72	78.64	0.64	25.00
Nagaland	80.63	6.81	7.02	67.66	16.64	7.34
Tripura	71.08	3.19	19.90	85.19	1.93	23.02
Mizoram	77.46	5.63	21.55	68.33	4.69	50.52

Source: Statistical Abstract, India

4.2.10 Shifting Cultivation and Mitigation Plan

Shifting (Jhum) cultivation is still the mainstay of traditional farming systems over areas in Mizoram. The area of rice production by the shifting cultivation is around 25,000 ha in 2011/12, while WRC area is 12,000 ha and their production ratio is break even as discussed in Section 4.2.2. Accordingly, the shifting cultivation is still important in rice production for Mizoram. Nevertheless, various attempts including on-going NLUP have been undertaken by the related government's agencies to transfer the Jhum farmers to settled farming. The Jhum area has been drastically decreased since 2008/09 from 40,000 ha level to date at 25,000 ha. Such drastic reduction was caused by partly the effect of NLUP, but mainly due to the Mahatma Gandhi National Rural Employment Scheme (MGNREGS) that provided a 100 day job a year for the rural poors. However, the vulnerability of Jhum lands remain substantially unchanged, because uncultivated Jhum area have been converted to oil palm plantation in the north and to ginger production extensively, inducing serous soil erosion, otherwise left fallow lands.

The following paragraphs explain the activities taken by the agro-allied departments to mitigate the shifting cultivation.

(1) Activities taken by DOA and Current Status

A special Central Assistance to State Plan Programme of Watershed Development Project in shifting cultivation areas (WDPSCA) for the benefit of Jhum cultivation families who are below the poverty line was implemented in 61 numbers of micro watershed projects with a target area of 30,000 ha during the 11th five year plan period. The financing of the scheme includes treatment of arable and non-arable lands, drainage line, creation of water bodies, development of agriculture, forestry and land based / household production system as package of rehabilitation components. The targeted area of treatment have been saturated as per plan and guideline and from which, quite a good number of Jhum cultivation families within the watershed project have adopted settled cultivation result in significant reduction of Jhum areas. In addition this, the practice Jhum cultivation could not be stopped at once, the department assist the Jhum farmers to develop Jhum land for productive use with improved cultivation methods and suitable package of practices including judicious use of fertilizers by placement application to enhance the productivity from the current level of 0,9 tonnes/ha to 1.5 tonnes/ha of rice.

(2) Activities taken by DOH and Current Status

To change the existing jhuming practices to permanent settlement of farming, horticulture is the one and only option. With this, although no specific programmes are taken, the DOA is taking active role

by implementing the mitigation of shifting cultivation through NLUP and CSS like HMNEH, RKVY, NMMI and NMMP.

(3) Activities taken by SWCD and Current Status

In order to wear away Jhum cultivation, the SWCD currently has two broad approaches: namely (i) cash crop plantation like rubber, coffee and broom for permanent occupation; (ii) enhancement of production and productivity of existing orchards, farmlands by providing water harvesting ponds/tanks, terracing for land development and river training works/drainage line treatments for prevention of river banks erosion, retention of silt and debris at regular intervals across the stream and impounding stream water for more time for agricultural purposes. Major works for soil and water conservations are given in Table 4.2.34.

Table 4.2.34 Main Works for Soil and Water Conservation Implemented by SWCD

Work	Unit	2009/10	2010/11	2011/12	2012/13
1. Hillside Terracing/Bench Terracing	ha	185	1,441	183	207
2. Contour Trenching/Staggered Trenching	ha	0	0	190	33
3. Rain water Harvesting/Farm Ponds	Nos.	0	0	244	336
4. Stream Banks Erosion Control	Nos.	0	110	650	900
5. Check Dams	Nos.	0	200	270	830
6. Logwood Bunding	ha	0	0	50	0
7. Agro Forestry	ha	0	0	25	0

Source : SWCD

4.2.11 Implementation and Progress of NLUP

(1) Department of Agriculture (DOA)

There are four different types of development component that the beneficiaries can select as follows:

- Wet Rice Cultivation on Flat lands (0 - 10% slope) i.e. WRC-I
- Wet Rice Cultivation on Flat lands (10 - 25% slope) i.e. WRC-II
- Oil Palm Cultivation
- Sugarcane Cultivation

The total assistance amount is released to the beneficiaries on an instalment basis through their individual Bank account. The number of instalments is 4 times for all agricultural components, and each instalment amount per hectare and beneficiary's contribution are showing in Table 4.2.35.

Table 4.2.35 Installment Rate for Each Component &Beneficiary's Contribution Rate

Component	Rate of Installment (Rs./ha)					Beneficiary's Contribution (Rs./ha)	(%)
	1st	2nd	3rd	4th	Total		
WRC - I	20,000	45,000	39,000	16,000	120,000	30,000	25
WRC - II	20,000	44,000	28,000	44,000	136,000	34,000	25
Oil Palm	20,000	40,000	28,000	12,000	100,000	30,000	30
Sugarcane	20,000	32,000	20,000	28,000	100,000	45,000	45

Source: Brief Report on Implementation of NLUP / Agriculture Sector 2013

The physical achievement of each development component is show in Table 4.2.36 below. However, achievement in area along with numbers of beneficiaries could not summarized because of lack of data.

Table 4.2.36 Achievement under the Development Component as of October 2013

Component	WRC - I	(%)	WRC - II	(%)	Oil Palm	(%)	Sugarcane	(%)	Total	(%)
No. of Beneficiaries (No.)	8,777	44	7,970	40	2,290	11	1,055	5	20,092	100

Source: Brief Report on Implementation of NLUP / Agriculture Sector 2013

According to results of Household Survey carried out by the JICA study Team, 96% of farm households replied that they received assistance from NLUP as shown in Table 4.2.37.

Table 4.2.37 Assistance Received by the Households under Government Schemes

Detail	No. of HH*	(%)
Received benefit under farm related Gov. Schemes: Yes	299	83
Received benefit under farm related Gov. Schemes: No.	61	17
Total	360	100

Sources of Assistance Replied 'Yes' (multiple answer for 299 HH)	No. of HH*	(%)
Integrated Watershed Development Programme (IWDP)	5	2
Integrated Wasteland Management Programme (IWMP)	2	1
New Land Use Policy (NLUP)	291	96
Others	4	1
Total	302	100

Note: HH means Household*
Source: Household Survey December 2013 - January 2014, JICA study team

(2) Department of Horticulture (DOH)

The assistance for the horticulture component is to distribute the nursery stocks of various fruits and perennial crops as shown in Table 4.2.38.

Table 4.2.38 Beneficiaries for Horticulture Sector

Trade	Nos. of Beneficiaries				
	1st Phase	2nd Phase	3rd Phase	4th Phase	Total
Grape	324	231	45	19	619
Passion fruit	166	132	78	40	416
M. Orange	4396	4142	2007	922	11467
Pineapple	1217	1024	585	181	3007
Chayote	285	131	30	18	464
Arecanut	2753	2515	1087	567	6922
Aloe vera	23	6	7	3	39
Tung	141	206	109	20	476
Tea	22	205	84	73	384
Mango			17	2	19
Total	**9327**	**8592**	**4049**	**1845**	**23813**

Source: Department of Horticulture, Government of Mizoram

(3) Soil and Water Conservation Department (SWCD)

The SWCD has implemented three trades like boom, rubber and coffee under NLUP. The annual progress and performance of the above trades are shown in Table 4.2.39.

Table 4.2.39 Progress and Performance of Plantation of Coffee, Rubber and Broom under NLUP

Name of Trade	Nos. of beneficiaries				
	1st Phase	2nd Phase	3rd Phase	4th Phase	Total
Broom	3865	2697	1516	691	8769
Rubber	659	436	265	114	1474
Coffee	872	412	241	93	1518
Total :	5396	3545	2022	898	11861

Source: Soil and Water Conservation Department, Government of Mizoram

4.2.12 Problems and Constraints for Development

Through close cooperation with DOA and DOH in the course of JICA study, the study team identified several problems and constraints in agricultural production. Most of them are fundamental problems for agricultural production and stemmed from institutional issues involved in the state government, DOA and DOH in particular. Various problems in farmers themselves and farming practices are also found, however those underlying problems are mainly or partly attributed to the institutional issues.

(1) Institutional and Human Resources Issues

(a) Improper Agricultural Statistics

There is a system lacking in collecting accurate agricultural information and data both in the Departments. Agricultural data collection in the field levels are not extensively carried out and/or not made according to the adequate standards due to the lack of proper technical knowledge, shortage of field staff and shortcoming of operation fund. In addition, the field staff have not been well educated and trained so far. Therefore, the data processing by the Departments are not made based on the real information, hence it can be said that the present agricultural statistics are not reliable and rather distort the real status of agriculture sector in Mizoram. Statistic is the foundation for all the activities undertaken by the government and private sectors as well, therefore, no realistic policy nor programmes in the agricultural sector could be established without accurate agricultural statistics. This problem is an issue to be urgently tackled.

(b) Lack of Mizoram's Own Targets and Programmes

As described in previous sub-section 4.2.1, no specific policies, targets and approaches are lacking in the agricultural administration, therefore no short and long term development plans of agriculture sector in a form of realistic way have not been prepared yet. The main activities of the Departments are concentrated in transacting CSS schemes of which subjects fluctuate time to time due to the policy of the Union Government like patch works. Privileging the CSS scheme due to the lack of state's budget as a matter of course, establishment of Mizoram's own agricultural targets and programmes will be given the first priority and then fund of the CSS be fully utilised in a form of suiting it to own targets and programmes.

(c) Insufficient of Human Resources Development

Through joint activities between the JICA study team and the Departments, it is recognised that the most departments' staff are insufficiently trained and experienced in their professions. As mentioned above, their activities are fully involved in the CSS programmes under those guidelines provided by the Union Government, technical guidance and extension works to the farmers based on their knowledge and idea considering particular agricultural environment of Mizoram are lacking, and this is often seen in state's flagship programme. Capacity development of the department staff from the higher level down to field level is also an urgent issue to be challenged immediately, although spanning over a certain longer period.

(d) Shortage of Mizoram's Own Fund for Agriculture

The CSS schemes have various conditionality in fund sharing between the states and the Union Government, ranging from 0% to 25% incurred by the state governments. Due to fund shortage, the state government tends to prevail over the scheme with lesser state's share. Unbalancing developments may take place among the sub-sectors of agriculture or the schemes once started may face discontinuity. The oil palm scheme under the DOA (CH) with 25% sharing seems to be a case at present.

(e) Administrative Gap between District and Villages

The DOA (CH) had field offices at the respective rural development blocks (RDD), but now there are neither RDD offices nor circle offices at present. An extension officer is stationed at each circle, however working his house based, thus actually no functioning. At least, he is engaged in crop production survey in and around his house, but not in the remote area due to lack of fund, motor cycles, etc. This is one of reasons for inaccurate agricultural statistics.

(f) Weakness of Research and Extension System

Seeds and seedlings for horticulture production are disseminated by the DOH in a standardized fashion, however, without enough consideration of diversification of the natural environment, or utilizing varieties and crops suitable for geographical characteristics. Crops and varieties have to be selected in due consideration of not only the natural conditions, but their marketability. In addition, proper guidance on the most suitable cultivation techniques for each variety is needed. Since the DOH does not have an experimental research unit, collaborative research with the Indian Council of Agriculture (ICAR) and KVK is essential. However, such a system has not been established yet. In addition, the number of extension workers in the horticultural centres and circle offices is small, and these workers in circle offices do not have any transport means such as cars or motorcycles. It is important to establish cooperation system between the DOH and other agriculture related departments for improving the extension services on all agricultural technologies.

(2) Farmers and Farming Practice Issues

(a) Poor Farm Management Skills

Change from the traditional Jhum cultivation to settled agriculture, especially on steep slopes, requires a larger input of labour and capital. To maintain and improve the livelihood of the farmers, they need to acquire adaptable farm management skills which are totally different from those for Jhum farming, however both the farmers themselves and government staff are kept unrecognised so far. There are cases that fruit orchards developed on lands reclaimed by assistance of the state government remain in decline of productivity because of no extension services by the government in terms of applicable farming technics and marketability, hence farmers have been kept in the same farming practices as used in Jhum. Some vegetable farmers around the Aizawl city achieve a relatively higher profit, however even these people do not know how to invest their inputs for the future. Continued support by the government is indispensable for farmers gaining self-sustainability.

(b) Weaknesses in Farmers' Organisations

Farmers' organisations exist only as an nominal window to receive development assistance. Such types of farmers' organization as functioning joint purchase of materials and machineries, joint use of machineries, joint shipment of products and the construction and use of common facilities have not been developed in Mizoram. It does not exist as an organisation in its own right, and management skills are also lacking.

(c) Fragmentation of Land Holding

Where land holdings are small, scattered and fragmented, it is difficult to provide development programme in a compact and comprehensive manner. Commercial plantation of any cash crop requires compact/cluster of sizeable areas in a particular location to facilitate better flow of input-output of farm produce, marketing etc. This is due partly to mal-land tenure system in Mizoram.

(d) Insufficient Use, Conservation and Management of Land

People in rural area not acquired proper knowledge of potential of land resources in their community. The community-based organisations have not been able to adequately formulate the concept of future agricultural development using locally available resources. The farmers also do not understand the best way to use and manage their land resources. Moreover, there is an insufficient recognition of the value of the land as a resource. Newly developed farm land and land converted from Jhum are not properly managed, and soil losses and degradations become a major problem. It is not only a problem of inadequate fertility management in farm land, but also unsustainable practices that degrade the soil are rampant.

(e) Lack of Water Resources in the Dry Season

Although Mizoram received abundant rainfall during Monsoon, most of the rain water drains out from the watershed areas leaving very small fraction percolating into the soil. Those percolated water (ground water) is the actual source of stream/river in the lean period. Since ground water storage on the sloping catchment area is too small, most of the small steams dry up after 1 - 2 months of rainy period. Because

of a lack of sufficient water harvesting structure, most of the horticulture fields cannot be irrigated during the dry season which hampers the production and productivity.

(f) Undeveloped Labour and Cost Saving Technologies

On steep slopes, cultivation, harvesting and transportation require intensive labour forces. However there is a delay in developing cost and labour saving tools/ machineries and techniques such as crop selection, training and pruning of fruit trees, management of vegetation in orchards that would be appropriate to this environment.

(g) Short Supply of Local Vegetables

Both producers and consumers are highly conscious of freshness and safety of agricultural products, and there is a high demand for fresh vegetables. However, the supply of those vegetables to market is insufficient. Thus, vegetables have been largely imported from other states such as Assam. The supply of local produce is particularly deficient during the dry and off seasons. The difficulty of accessing irrigation water is one reason why vegetables cannot be grown during the dry season, and during rainy seasons, plant diseases can break out in open fields. Investment aimed at producing vegetables during off season has not been forthcoming.

(h) Undeveloped Food and Flower Industries

The productivity of the state-run fruit processing plant is low because the system and capacity of management is inadequate. Thus, more active recruitment or privatization needs to be considered. On the other hand, according to the grape growers' society, there are new movement in winery operation. The development of a food industry based on these types' special products with grower societies can be expected. However, at present the production scale for wine is still very small.

Since an independent sales network for cut flowers has been established through investment by flower exporters and the flower growers' society, the flower industry has a high growth potential. However, according to the producer society, the accesses to the market are weak, and it is hard even to obtain packaging materials.

Although private investment is essential for industrialization, development of basic infrastructure such as roads and electricity has been delayed. Therefore, private sector of agriculture and allied industries within the state has not been developed yet. Under present circumstances, it would have to be said that the environment for growing the industries for food and flower is quite poor.

4.3 Irrigation and Water Resources Management

4.3.1 Policy, Institution and Plan

(1) National Level

The Ministry of Water Resources (MOWR), GOI, is the nodal agency responsible for water-related development including irrigation, hydropower and flood control, and water resources management. Its mandates, in summary, are as follows:

- Overall planning, policy formulation, coordination, guidance and monitoring of irrigation, flood control, and multipurpose projects (major/medium);
- Providing special central financial assistance for specific projects and assistance in obtaining external finance from the World Bank and other agencies;
- Planning and guidance in respect of minor irrigation and command area development, administration and monitoring of centrally sponsored schemes, and promotion of participatory irrigation management;
- Planning for the development of groundwater resources, establishment of utilizable resources and formulation of policies of exploitation, overseeing of and support to state-level activities in groundwater development;
- Formulation and determination of water balance of different basins/subbasins, and coordination, mediation and facilitation of differences or disputes relating to interstate rivers; and
- Operation of the central network for flood forecasting and warning on interstate rivers.

Water resources development and management in India have been, by and large, states' subject, and also traditionally project oriented. This has historically caused the interregional, interstate, intrastate and inter-sectoral disputes in sharing of water strain relationship and hamper the optimal utilization of water through scientific planning on basin/sub-basin basis. The MOWR issued a national water policy (NWC) three times in 1987, 2002 and 2012 with recognition of the need for a minimal national consensus on perception, concepts and principles of water utilization and management for the whole nation. However, a NWC has no legal status. During the stakeholders meetings for evolving the National Water Policy 2012, a consensus emerged that a national water framework law was needed for governing the exercise of legislative and/or executive powers by the central government, the states, and the local governing bodies. The MOWR has organised a committee to draft a National Water Framework Law in July 2012, and a report of the committee was submitted to the MOWR in May 2013. The draft law comprises the following main articles: (i) basic principles of water management, (ii) right to water, preservation of quality and water pricing, (iii) planning and management of water resources projects, (iv) promotion of innovation and technology, (v) convergence of schemes, and (vi) coordination and policy support mechanism.

The draft law pays particular attention to groundwater, on which India depends for more than one-thirds of water needs in providing irrigation and drinking water. The present legal situation gives every landholder the right to pump unlimited quantities of groundwater for private use, hence this is leading to deterioration in water quality and decline in water table across the country. The draft law urges the need for regulating groundwater through community participation, regulation in electricity, preservation of recharge zones, and prevention of pollution.

For the irrigation subsector, the National Water Policy gives a specific concern, stating that grossly inadequate maintenance of existing irrigation infrastructure has resulted in wastage and under-utilization of available resources; hence, there is a widening gap between irrigation potential created and utilised.

(2) State Level

No administrative unit exists in the State Government of Mizoram for governing water resources management in an integrated manner. The water-related projects and management are individually undertaken, i.e., hydropower by the Power and Electricity Department, water supply by the Public

Health Engineering Department (PHED), and watershed conservation by the Environment and Forest Department (EFD).

The Minor Irrigation Department (MID) is the agency responsible for the implementation and maintenance of minor irrigation schemes for areas smaller than 2,000 ha[1]. The MID was established in September 1984 as a "Minor Irrigation Cell" under the Agriculture Department, and became an independent unit as the Minor Irrigation Department in 2007. There is no specific state policy, laws and regulations governing irrigation subsector in Mizoram. The mandates of the MID are to plan, survey, design and construct irrigation schemes, almost all of which are centrally sponsored in financing, and to assist beneficiaries in the technical and financial operations and maintenance of the irrigation facilities.

(3) Organisation of the MID and Staff

The MID, led by a chief engineer, has two cells headed by superintendent engineers for planning and monitoring and works and design at Aizawl headquarters. It also has four division offices headed by executive engineers in Aizawl, Champhai, Kolasib and Lunglei, covering eight administrative districts of Mizoram. The MID is proposing to establish four additional division offices at Mamit, Serchhip, Lawngtlai and Saiha. The MID's organisational chart is shown in Figure 4.3.1

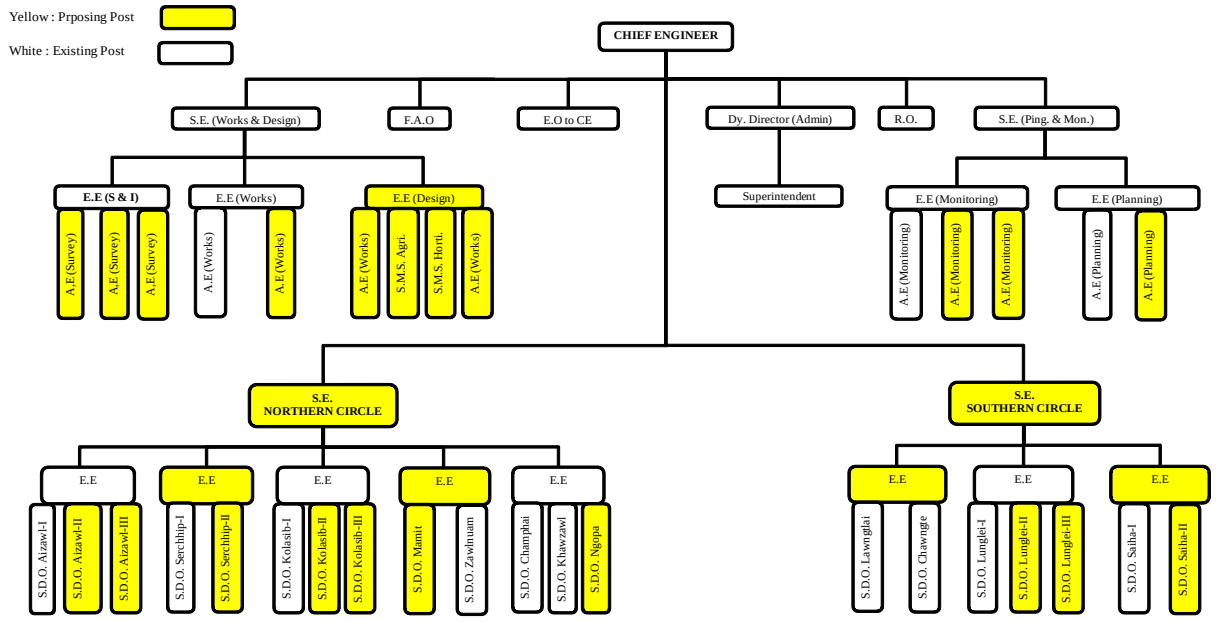
Table 4.3.1 shows the post-wise central and regional personnel distribution, and Table 4.3.2 shows the educational level of service personnel.

Table 4.3.1 Post-Wise Personnel Distribution Under the MID (as of March, 2014)

Sl. No.	Post		Department Headquarter	Division Office	Total
1	**TECHNICAL**				
	a	Chief Engineer	1	-	1
	b	Superintending Engineer	2	-	2
	c	Executive Engineer	5	4	9
	d	Sub Divisional Officer/ Assistant Engineer	3	14	17
	e	Junior Engineer/ Draftsman	3	42	45
	f	Other Technical Field Staff	2	44	46
	TOTAL		**16**	**104**	**120**
2	**MINISTERIAL**				
	a	Deputy Director (Admin)	1	-	1
	b	Superintendent	1	-	1
	c	Assistant	5	4	9
	d	Upper Division Clerk	1	16	17
	e	Lower Divisional Clerk	5	19	24
	f	Others	6	35	41
	TOTAL		**19**	**74**	**93**
3	**OTHER**				
	a	Research Officer	1	-	1
	b	Finance & Accounts Officer	1	-	1
	c	Divisional Accountant	1	4	5
	d	Assistant Divisional Accountant	1	4	5
	e	Inspector of Statistics	2	-	2
	f	Steno	3	-	3
	TOTAL		**9**	**8**	**17**
	GRAND TOTAL		**44**	**186**	**230**

Source: Minor Irrigation Department

[1] The irrigation projects in India are classified into three categories, i.e., major, medium and minor. Projects having a cultivable command area (CCA) of more than 10,000 ha are termed as major projects, those which range from 10, 000 ha to 2,000 ha are termed as medium projects, and those less than 2,000 ha are known as minor projects. No measure scheme is considered in Mizoram, and no medium scheme exist at present but may be subject to further study here.



Source: Minor Irrigation Department

Figure 4.3.1 Existing and Proposed Organisational Chart of the Minor Irrigation Department

4.3.2 Overview of Irrigation Development in Mizoram

(1) Background of Irrigation in Mizoram

The history of irrigation development in Mizoram can be traced back to the year 1987. The first two irrigation schemes were constructed in Kolasib District, one is river diversion scheme at Chemphai Village with a cultivable command area (CCA) of 45 ha, and the other is pump irrigation scheme at Thingdawl Village with a CCA of 20 ha.

In 1992, the Mizoram State entrusted Water and Power Consulting Services (India) Limited (WAPCOS) to prepare a master plan for the development of minor irrigation in the Mizoram State. The master plan study was carried out for a 32-month period from September 1992 to April 1995. The objectives of the master plan were to study the sectoral needs and potential of water resources and to identify suitable types of minor irrigation schemes for cultivable land subject to the availability of water resources. The master plan study identified the irrigation potential of about 93,000 ha in total including the existing schemes, consisting of surface water diversion of 36,000 ha, pump irrigation of 17,000 ha, small-scale tank and pond irrigation of 36,000 ha, and groundwater irrigation of 4,000 ha.

Table 4.3.2 Educational Level of Service Personnel

Sl. No.	Educational Level		Department H/Q	Division Office	Total
1	**TECHNICAL**				
	A	PHD	-	-	
	B	Post Graduate	1	1	2
	C	Graduate	8	14	22
	D	Diploma	2	28	30
	E	Other	2	15	17
		TOTAL	**13**	**58**	**71**
2	**GENERAL**				
	A	PHD	-	-	-
	B	Post Graduate	-	4	4
	C	Graduate	11	9	20
	D	HSSLC	-	5	5
	E	HSLC	8	31	39
	F	Below High School	10	31	41
		TOTAL	**29**	**80**	**109**
		GRAND TOTAL	**42**	**138**	**180**

Note: While there are 230 various posts in the Minor Irrigation Department, only 180 posts are filled at present.
Source: Minor Irrigation Department

(2) Present Minor Irrigation Schemes

Since the year 1987, when the first two irrigation schemes were completed, 439 minor irrigation schemes with a total CCA of 18,228 ha have been constructed to date in Mizoram. Table 4.3.3 shows the year-wise development of minor irrigation schemes together with investment cost. Table 4.3.4 shows the district-wise distribution of minor irrigation schemes, and those locations are shown in Figure 4.3.2.

Table 4.3.3 Year-wise Development of Minor Irrigation Schemes

Year	No. of Schemes	GCA (ha)	CCA (ha)	Cost (Rs.)
1987 - 1988	2	68	65	926,000
1988 - 1989	2	58	51	2,125,153
1989 - 1990	1	106	100	4,710,807
1990 - 1991	-	-	-	-
1991 - 1992	4	136	126	6,071,429
1992 - 1993	2	87	80	1,859,250
1993 - 1994	3	114	101	3,869,340
1994 - 1995	3	168	148	4,008,390
1995 - 1996	2	101	90	1,362,400
1996 - 1997	-	-	-	-
1997 - 1998	4	279	260	10,399,500
1998 - 1999	16	550	452	28,832,000
1999 - 2000	10	608	544	32,128,400
2000 - 2001	22	757	692	49,871,800
2001 - 2002	14	750	637	52,909,000
2002 - 2003	11	573	401	53,041,000
2003 - 2004	3	435	422	30,270,000
2004 - 2005	2	49	42	7,421,000
2005 - 2006	48	1,396	1,195	230,226,100
2006 - 2007	20	690	592	106,853,400
2007 - 2008	77	3,546	3,186	577,949,100
2008 - 2009	62	3,070	2,769	612,386,600
2009 - 2010	39	1,912	1,729	349,225,000
2010 - 2011	43	2,177	1,907	421,960,000
2011 - 2012	49	2,145	2,639	714,431,900
Total	**439**	**19,775**	**18,228**	**3,302,837,569**

Note: GCA: Gross Command Area, CCA: Cultivable Command Area
Source: Minor Irrigation Department

Table 4.3.4 District-wise Development of Minor Irrigation Schemes

District	Type of Scheme	No. of Schemes	GCA (ha)	CCA (ha)	Cost in Rs.
Mamit	River diversion	41	1,764	1,639	289,156,700
Kolasib	River diversion	76	4,057	3,705	504,032,290
	Pump irrigation	2	44	40	969,000
	Sub-total	78	4,101	3,745	505,001,290
Aizawl	River diversion	63	2,561	2,379	537,457,200
Champhai	River diversion	87	3,913	3,800	685,072,410
	Pump irrigation	1	10	6	3,541,000
	Sub-total	88	3,923	3,806	688,613,410
Serchhip	River diversion	51	2,680	2,528	432,804,107
Lunglei	River diversion	60	2,644	2,129	449,296,153
Lawngtlai	River diversion	33	1,406	1,387	286,805,900
Saiha	River diversion	25	696	615	113,702,809
River diversion total		436	436	19,721	18,182
Pump irrigation total		3	3	54	46
Total		439	439	19,775	18,228

Source: Minor Irrigation Department

Typical Intake from Stream

Typical Intake from Stream

Typical Canal for WRC

Water Storage Tank for Horticulture

Source: JICA Study Team

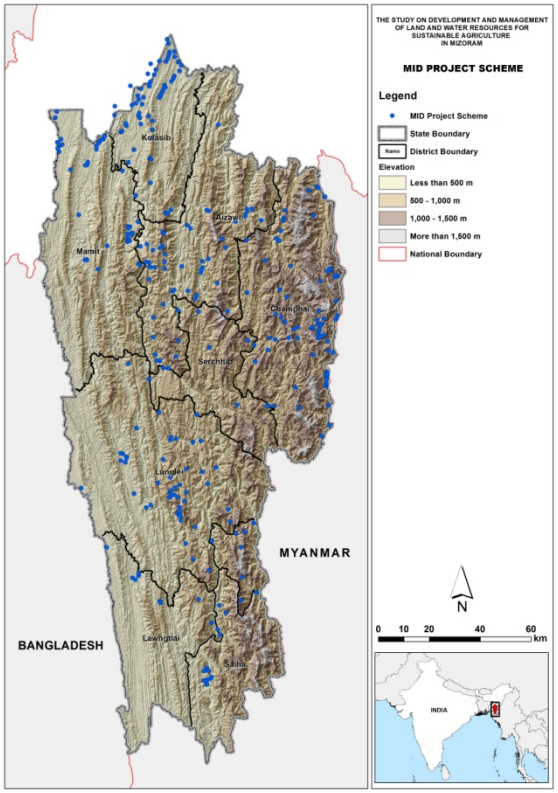
Photo 4.3.1 Typical Irrigation Facilities

The scale of command area in terms of GCA and CCA in the above table is a planned and designed figure given in the Detailed Project Report (DPR). There may be a certain discrepancy between the designed and those actually serviced due to a lack of adequate topographic maps and cadastral information at the site. The inventory survey for all the 439 schemes was carried out in this JICA study and it reveals the actual conditions of irrigation schemes in Mizoram as discussed in the subsequent section herein. According to the data given in the DPR, the average scale of river diversion scheme is about 42 ha in CCA, ranging from the largest 250 ha to the smallest 3 ha.

(3) Characteristics of Irrigation System

Mizoram has a predominantly mountainous and hilly topography where jhum is the main method of agriculture on sloping land, while the land suitable for irrigated agriculture is confined in the narrow area along the rivers. Its scale is not more than 2,000 ha and categorised as minor irrigation in India. The characteristics of irrigation system in Mizoram are summarised as follows:

- The minor irrigation schemes are servicing water to two types of agriculture, i.e., water rice cultivation (WRC) and upland and horticulture crops. The prevailing crops irrigated are water rice in relatively flat land, and irrigation schemes for upland and horticulture crops on sloping land are nominal.
- Almost all of the irrigation system is of run-off-the-river diversion type with gravity distribution, while pump irrigation directly from the water sources is limited to as few as only three out of the present 439 schemes in Mizoram.
- Most schemes rely on small streams as water sources. Running water in these rivers become scarce during



Note: Four schemes located in Assam State in the map are under control of MID Mizoram due to border issues between two states
Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.2 Location of Minor Irrigation Schemes in Mizoram

the Rabi and summer period; therefore, there is virtually no irrigated agriculture practiced in Mizoram, except for schemes having water storage facilities.

4.3.3 Development Investment by the Government

(1) Centrally Sponsored Schemes

Since the beginning of irrigation development started in 1987 in Mizoram, all the schemes have been constructed on a centrally sponsored basis. The MID is currently undertaking the following four schemes supported by the respective programmes of the MOWR, GOI:

i) Minor irrigation schemes under Accelerated Irrigation Benefits Programme (AIBP);
ii) Anti-erosion scheme under Flood Management Programme (FMP);
iii) On-farm development works in completed minor irrigation projects under Command Area Development &Water Management Programme (CAD&WMP); and
iv) Coordinating statistics relating to Minor Irrigation Projects under Rationalization of Minor Irrigation Statistics (RMIS).

In the 12th Five-Year Plan of the Mizoram State (2012–17), the MID proposed the following financial targets, amounting to Rs. 7.5 billion to be achieved within a five-year period for the respective four schemes:

(i) Minor Irrigation Scheme:	Rs. 6,441.3 million
(ii) Anti Erosion Schemes:	Rs. 878.7 million
(iii) CAD and WMP:	Rs. 160.0 million
(iv) RMIS:	Rs. 20.0 million
Total	Rs. 7,500 million

(2) Accelerated Irrigation Benefits Programme (AIBP) for Minor Irrigation Scheme

(a) Policy and Outline of AIBP

The AIBP was conceived in the year 1996 by the GOI in order to provide financial assistance to states to complete various ongoing projects, so that envisaged irrigation potential of the project could be created and thereby extend irrigation to more areas. Since its formulation, the terms of the programme have been widened and liberalized over time. The present AIBP makes the following projects eligible: (i) major, medium and Extension, Renovation and Modernization (ERM) projects; and (ii) surface water minor irrigation schemes of Special Category States covering northeastern states including Mizoram, hilly states, and drought prone areas.

The latest AIBP guidelines, modified in October 2013, provides the eligibility criteria for assistance to minor irrigation schemes such as: (i) individual schemes should have at least a CCA of 10 ha and a cluster of schemes within a 5 km radius having a CCA of 20 ha; (ii) proposed schemes should have a benefit-cost ratio of more than 1.0; and (iii) the development cost per ha of CCA of individual scheme is less than Rs. 2.5 lakh. For new schemes in special category states, the central assistance grant under AIBP is 90% of the project cost (work component). The construction period for projects under AIBP assistance is two years starting from the financial year of the first release of funding. The schemes which are not progressing as per schedule may be given a maximum time extension of two years and a maximum escalation cost of 20%, based on justification provided by the state with the approval of the Secretary of the MOWR.

Monitoring of the minor irrigation schemes has to be done by the state government based on geographic information system (GIS) maps. These schemes have to be monitored periodically on sample basis (at least 5% of schemes) by the concerned regional offices of CWC and assessed against predetermined targets set by the MOWR. The evaluation for completed schemes is made by the state government.

(b) AIBP Assistance for Mizoram

The Mizoram State started to receive AIBP assistance on a grant basis in 2001, and since then, an amount of about Rs. 2.6 billion has been provided up until 2011-12. The most common procedural steps for implementing minor irrigation schemes from planning to handing over to beneficiaries under

AIBP are mentioned below. However, according to the MID, these steps are not standardized and some steps are changeable.

Table 4.3.5 Common Procedural Steps for Implementing Minor Irrigation Schemes

Steps		Contents
1	Project level request	Farmers/potential beneficiaries and/or village council submit project request letter to Minister/CE/MID division office.
2	Preliminary survey of site condition	Confirmation of site condition, like water source, geological condition and land ownership by way of joint verification by department personnel and potential beneficiaries.
3	Screening by division office and chief engineer	Screening is to be conducted by division office and chief engineer.
4	Discussion with farmers	Probable outline of project discussed in detail with farmers.
5	Field survey	Technical field survey by SDO or EE in close association with the farmers.
6	Preparation of DPR	Preparation of DPR by SDO or EE.
7	Chief engineer office check	Chief engineer office is to check DPR and approve.
8	Finalization by MID Mizoram	Finalization by MID Mizoram.
9	Technical advisory committee check	Technical advisory committee is to check and approve.
9	Secretary of MID Mizoram check	Secretary of MID-Mizoram to approve and forward to the Planning Department.
10	Planning Department of Mizoram check	Planning Department of Mizoram to approve and forward to CWC.
11	CWC of Shillong check	CWC of Shillong is to check and approve.
12	Ministry of Water Resources of Delhi check	Ministry of Water Resources of Delhi to approve and release central government sanction
13	Planning Department and Finance Dept. GOM	Issues administrative approval and the Finance Department to expedite expenditure sanction
15	Preparation of tender documents	Preparation of tender documents by EE.
16	Approval of tender documents	Approval of tender documents by the chief engineer office.
17	Tender	Tender is to be floated by EE.
18	Approval of tender result	Approval of tender result by the chief engineer office.
19	Contract and construction work	Contract with contractor and construction work.
20	Handover to WUA	After construction, irrigation facility is to be handed over to WUA.
21	Operation and maintenance	Operation and maintenance by WUA with assistance from the MID.

Source: Minor Irrigation Department

(3) Other Small Irrigation Schemes

In addition to the MID, other agencies of the state government are providing supplementary and miscellaneous irrigation facilities including minor rehabilitation. These agencies are the Department of Agriculture (DOA), the Department of Horticulture (DOH) and the Rural Development Department (RDD). The features of these irrigation schemes are summarised below.

(a) Department of Agriculture (DOA)

The Department of Agriculture is committed to attain self-sufficiency in food grain production and to make agriculture a sustainable and viable vocation for livelihood support. To achieve this, the

department is implementing various state and central schemes, including relevant infrastructure development, to enhance agricultural crop production, thereby improving the income level of farmers. The followings are expected related outcomes which are described in the 12th Plan of DOA.

- At the end of the 12th Plan, additional 20,000 ha of WRC will be created and then 31,000 ha will be available for crop production with targeted cropping intensity of 150%, which is expected to meet at least 50% of the rice requirement of the state.
- The area under the improved package of practices of rice will be increased from 3,000 ha to 5,000 ha with targeted productivity increases from 2 t/ha to 2.5 t/ha.
- The irrigated area will be increased significantly.

1) Land Development

With the implementation of New Land Use Policy, Rashtrya Krishi Vikas Yagona (RKVY) and Macro Management of Agriculture (MMA), a total of additional 1,790 ha. of WRC has already been developed until February 2013 and more than 1,000 ha of WRC had been improved and maintained.

2) Construction of Potential Area Connectivity (PAC)

During the 11th Five-Year Plan, a total of 120 km of new PAC was constructed, connecting potential areas of different locations and about 540 km of existing PAC was maintained at different places. During 2012-13, new construction of PAC at different locations is proposed under RKVY covering eight districts of Mizoram.

Table 4.3.6 Irrigation-Related Project Plan under RKVY(2012-2013)

Name of projects	Target (Rs. in lakhs)	
	Physical	Financial
Diesel/electric-driven water pump set up to 7.5 BHP/5KW	365	36.50
Development of irrigation facilities : Rain Water Harvesting Tank/Ponds (15×15×1.5 m) with a capacity of 3.3 lakhs-L	120	120.00
Pipes for carrying water from source to the field	500	75.00
Development of Rain-fed Farming System in Watershed areas: Assistance for land development	5634 (ha)	676.00

Source: Department of Agriculture

(b) Department of Horticulture (DOH)

Horticulture occupies a very important place in the economy of Mizoram and contributes substantially to the State Gross Domestic Product. Out of the total horticulture potential area of 11.56 lakhs ha., only 1.09 lakhs area is presently utilised, leaving more areas for settlement of jhumia families, indicating the vast scope for horticulture development in the state, as horticulture is the only alternative for development of the hilly terrain and increasing production and productivity. Table 4.3.7 shows the achievement of irrigation-related facilities under DOH.

Table 4.3.7 Development Achievement of Irrigation-related Facilities under DOH

	Unit	Aizawl	Kolasib	Lunglei	Saiha	Mamit	Lawngtlai	Serchhip	Champhai	Total
2009-10/ Technology Mission for Northeastern States										
Community water tank	No.	45	30	30	20	40	20	30	30	245
	Rs. lakhs	45.00	30.00	30.00	20.00	40.00	20.00	30.00	30.00	245.00
Tube well	No.	100	100	100	56	100	56	100	100	712
	Rs. lakhs	12.50	12.50	12.50	7.00	12.50	7.00	12.50	12.50	89.00
2010-11 Technology Mission for Northeastern States										
Community Water Tank	No.	1	0	0	0	0	0	0	0	1
	Rs. lakhs	17.25	0	0	0	0	0	0	0	17.25
Water harvesting system for individual water storage	No.	60	40	40	20	40	20	40	40	300
	Rs. lakhs	61.80	41.20	41.20	20.60	41.20	20.60	41.20	41.20	309.00
2011-12/ National Mission on Micro Irrigation										
Community Water Tank	No.	0	0	0	0	0	0	0	0	0

	Unit	Aizawl	Kolasib	Lunglei	Saiha	Mamit	Lawngtlai	Serchhip	Champhai	Total
	Rs. lakhs	0	0	0	0	0	0	0	0	0
Water harvesting system for individual water storage	No.	100	63	65	40	65	50	65	65	513
	Rs. lakhs	103	64.89	66.95	41.20	66.95	51.5	66.95	66.95	528.39
2012-13/ National Mission on Micro Irrigation										
Community Water Tank	No.	0	0	0	0	0	0	0	0	0
	Rs. lakhs	0	0	0	0	0	0	0	0	0
Water harvesting system for individual water storage	No.	53	10	10	6	10	6	10	56	161
	Rs. lakhs	54.59	10.3	10.3	6.18	10.3	6.18	10.3	57.68	165.83
2013-14/ National Mission on Micro Irrigation										
Community Water Tank	No.	9	7	7	3	7	3	7	7	50
	Rs. lakhs	155.25	120.75	120.75	51.75	120.75	51.75	120.75	120.75	862.50
Water harvesting system for individual water storage	No.	400	65	60	30	55	15	50	80	755
	Rs. lakhs	412.00	66.95	61.80	30.90	56.65	15.45	51.50	82.40	777.65

Source: Department of Horticulture

(c) Rural Development Department (RDD)

The main tasks of the RDD is to improve the socioeconomic conditions of the rural communities and to uplift the people living below the poverty line by providing wage employment, self-employment through income generating activities, and also to create permanent assets for strengthening the rural infrastructure. Its programmes are considered to have an objective to relieve unemployment in rural communities, spreading over a wide range from provision of housing materials to integrated watershed management. Almost all the programmes are on a centrally assisted basis, and those funding are from the various ministries of the GOI related to the nature of programmes. Irrigation is one of the RDD programmes, mainly providing irrigation channels with a length of 1 to 3 km upon the request of the community. According to the RDD, rehabilitation of damaged canals constructed in minor irrigation scheme is also serviced. The annual budget allocated to the irrigation works in RDD were minimal, being Rs. 49 lakh in 2008-09, Rs. 11 lakh in 2009-10, Rs. 29 lakh in 2010-11, Rs. 50 lakh in 2011-12, and Rs. 20 lakh in 2012-13.

4.3.4 Management and O&M of Irrigation Facilities

With regards to existing O&M conditions of irrigation facilities, it was found that 70% of the water user associations (WUAs) under minor irrigation scheme think rehabilitation (big or small) is necessary and more than half of the schemes has experienced flood damages (permanent: 16%, temporary: 48%) through inventory survey result. Furthermore, only 7% of WUAs collect water use fees from their members regularly, and the capacity of WUAs is not enough for sustainable management and O&M of irrigation facilities.

The MID side also have problems in management and O&M of irrigation facilities, especially shortage of O&M-related budget. Most MID projects, as mentioned in Section 4.3.3, are centrally sponsored schemes like AIBP and CAD. The main target of these schemes are new irrigation area development, which cannot be applied to rehabilitation or repair works of existing scheme facilities. Therefore, under the circumstances, the MID cannot help, depending only upon the very limited state-allocated budget for management and O&M-related activities. So far, the MID does not have enough elaborate and prepared concrete policy on management and O&M of existing facilities.

After completion of construction works, Minor Irrigation Scheme is to be handed over from the MID to WUAs. Basically, O&M of irrigation systems, including collection of water charges or user's fee if and when necessary, and ensuring optimum utilization of created irrigation potential, will be vested on the WUA along with ownership of the assets. However, it was found that many WUAs have problems in O&M of irrigation facilities through inventory survey.

WUA was formed under all completed minor irrigation projects. WUA is an association of farmers and the membership is limited to shareholders of an irrigation outlet. WUA will be a registered body having a general body and managing committee.

Farmers need to maintain the irrigation structures constructed under the scheme. It is therefore essential to involve WUAs in the planning and execution of the works, equitable distribution of irrigation water among all the beneficiaries, and repair and maintenance of the distribution network after the same is handed over to them for management.

Prior to the formulation of the project report, a meeting/awareness campaign is to be held by the MID with all the shareholders/beneficiaries of the proposed irrigation scheme and members of the local village council. In this meeting, necessity of the project is discussed at length. The meeting also aims to motivate and educate the beneficiaries about the benefits of the proposed scheme and formation of WUA. Stress was laid on the participatory feature of WUA, sense of ownership, self-governance, and long-term benefits, etc.

The WUA should be a registered body. It should have a functional governing body, and the executive members will be elected by the general body. It shall have a minimum of two meetings in a year.

The primary aims and objectives of the WUA shall be as follows:

- Equitable and uniform distribution of available irrigation water among all users.
- Adequate repair and maintenance of watercourses and keeping it in running condition by clearing of silt and vegetation.
- Ensure efficient and economical use of canal water.
- Agricultural extension program.
- Activities for the welfare of all the users/members.
- Protection of environment and ecological balance.

4.3.5 Facts of Existing Irrigation Schemes

(1) Inventory Survey for Existing Irrigation Schemes

The MID has been implementing 439 minor irrigation schemes so far since 1987 and under AIBP assistance since 2001. These schemes were transferred to the beneficiaries for their operation and maintenance, and the MID has hardly been involved in the completed schemes except in special cases. The MID neither has information of these completed schemes nor has been monitoring the conditions of schemes' facilities. The JICA Study Team found several difficulties in irrigated agriculture in Mizoram, through discussions with the MID and field reconnaissance, that the actual irrigation area differed from the planned figures in the DPRs, and that the facilities actually provided were not constructed according to the designs of DPR, many schemes were left entirely or partially non-functional due to failure and/or damage to the irrigation facilities, etc. It was revealed that the MID does not understand the real conditions of these completed schemes due to the lack of an information management system.

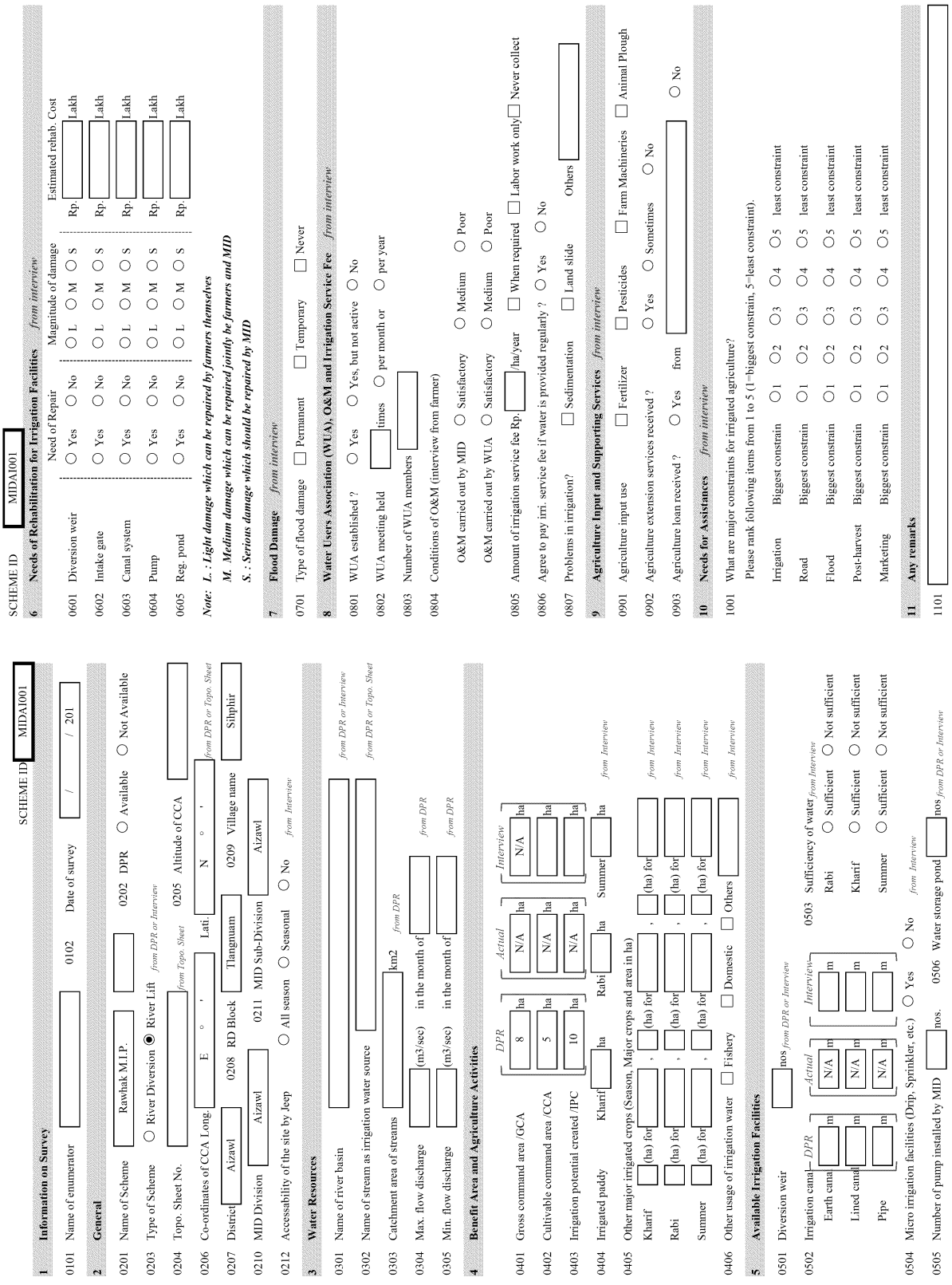
The MID has recognised the lack of database for existing irrigation schemes to be a serious issue for its undertaking as the responsible agency for irrigation administration. The MID has decided to carry out an inventory survey for the existing irrigation schemes for necessary activities to be undertaken for remedying and improving inadequately operated and maintained schemes. The inventory survey was carried out by the MID, mobilising a number of division offices under the guidance of the JICA Study Team. The inventory survey is outlined below.

(a) Outline of the Survey

Objective	Understanding the real conditions and establishment of database system of existing irrigation schemes
Period	4 November 2013 to 31 January 2014
Targeted Schemes	439 existing minor irrigation schemes
Methodology	The MID officers fill out the Inventory Sheet necessary data and information through interviews with WUAs (beneficiaries) of the respective irrigation schemes. The actual measurement of CCA and length of irrigation canals in the 28 selected irrigation schemes should be taken by GPS to confirm the difference between DPR and ground situation.

(b) Questionnaire

The inventory survey questionnaire sheet is shown in Figure 4.3.3.



Source: JICA Study Team

Figure 4.3.3 Inventory Survey Sheet Form

(2) Overview of Existing Irrigation Schemes in Mizoram

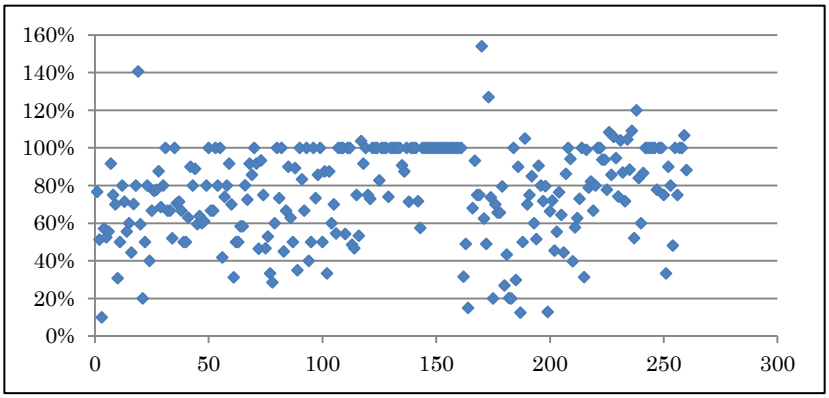
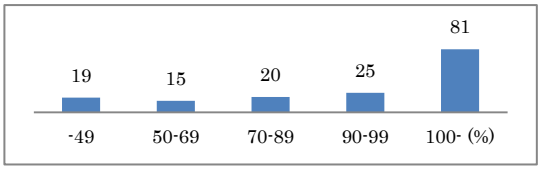
The inventory survey for all the 439 schemes has been carried out in this JICA study, and it reveals existing conditions of irrigation schemes in Mizoram.

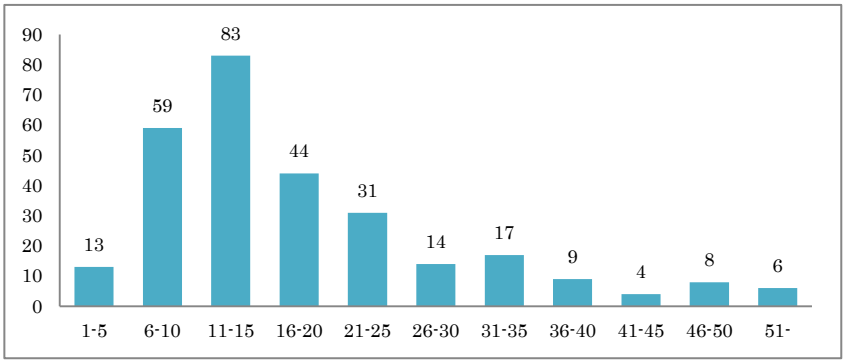
The following are overviews of existing irrigation schemes, extracted from the result of inventory survey.

As of 23 February, 2013, **374** scheme data were collected out of 439.

1) Survey Result Summary

Table 4.3.8 Abstract of Inventory Survey Results

Projects Summary from the MID project list	No.: 439, Total cost: Rs. 3,302,837,569 Total GCA:19,775 ha, Total CCA = 18,228 ha, Total IPC = 37,730 ha Average CCA= 41.5 ha, Average cost per CCA: Rs. 181,195 Average number of schemes per year in the last 5 years = 48 Average scheme cost in the last 5 years = Rs. 8,914,296 No. of ongoing schemes: 16
Accessibility to site	All seasons: 108 (36%), Seasonal: 186 (62%), No: 7 (2%)
CCA area	Valid responses：260, Average CCA: 32.0 ha Survey result/DPR average：77%、 Survey result/DPR average (100%～)：80/260 = 31% Survey result/DPR average (50～100%)：135/260 = 52% Survey result/DPR average (～50%)：45/260 = 17%  Distribution Map of “Survey result/DPR Ratio”
Irrigated paddy (kharif) Irrigated paddy (rabi)	No.: 295 (79%) No.: 52 (14%)
Other major crops in kharif	Average area: 1.9 ha Mustard: 8/374 = 2%, Maize: 14/374 = 4%, Other vegetables: 30/374 = 8%, Fruits: 11/374 = 3%, Peas and Beans: 5/374 = 1%
Other major crops in rabi	Average Area: 2.6 ha Peas and beans: 115/374 = 31%, Mustard: 105/374 = 28%, Other vegetables: 72/374 = 19%, Potato: 36/374 = 10%, Cabbage: 52/374 = 14%, Maize: 7/374 = 2%, Fruits: 3/374 = 1%
Other usage of irrigation water	Fishery: 150 (40%), Domestic: 83 (21%)
Actual lined canal length (DPR/Survey result)	 Valid responses：160, Average ratio86%

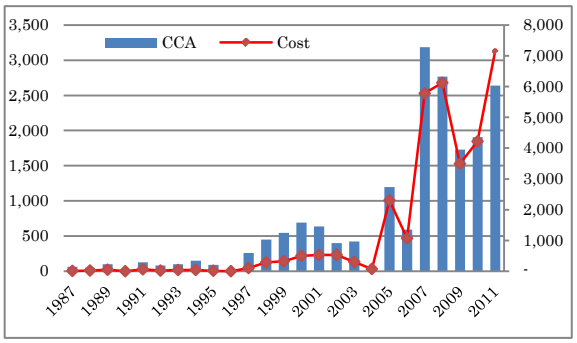
Sufficiency of water (Sufficient percentage)	Rabi: 14%, Kharif: 72% , Summer: 8%
Irrigation facilities	Scheme with pump : 36 (10%) Scheme with micro irrigation : 19 (5%) Scheme with storage tank : 233 (62%)
Needs for rehabilitation	No. of needed schemes : 262/374 (70%) Diversion weir: 148, Average estimated repair cost: Rs. 2.0 lakh Gate: 66, Average estimated repair cost: Rs. 0.7 lakh Canal: 208, Average estimated repair cost: Rs. 3.1 lakh
Type of flood damage	Permanent: 52 (16%), Temporary: 162 (49%), Never: 120 (35%)
WUA conditions	Valid responses：362 schemes Total beneficiaries：5148 persons Average beneficiaries：19 persons/WUA No. of schemes which WUA could not be confirmed: 18 No. of WUA collecting fees：26 (7%) ・ Average WUA collected fees：Rs. 6,691/ha/year  Distribution of WUA members
WUA O/M conditions	Satisfactory: 66 (23%), Medium: 133 (46%) , Poor: 89 (31%) Sediment problems: 202/374 (54%) Landslide problems: 206/374 (55%) Damaged: 101/374 (27%)
Agriculture input	Fertilizer: 73/374 (20%), Pesticides: 54/374 (14%), Farm machineries: 140/374 (37%), Animal ploughs: 232/374 (62%) Extension service: 164/340 (48%) received, No:176/340 (52%) Agriculture loan: 6/344(2%) received, No: 338/344 (98%)
Needs for assistance (1-5 ranking)	Irrigation: 1.8, Road: 2.8, Flood: 3.4, Postharvest: 4.4, Marketing: 4.4

Source: MID Inventory Survey 2013

2) Findings

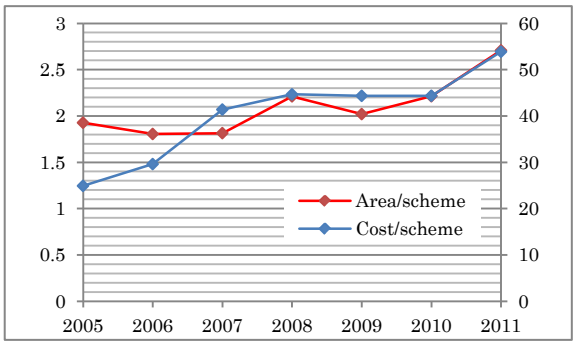
a) Findings from the MID Project List

- The MID's development area and cost has increased significantly since 2007, when the MID had become an independent department from DOA.
- Annual unit cost and CCA per scheme is increasing for the last six years.
- District-wise MID projects figures (Table 4.3.9) shows that Champai District received the most MID projects in regard to cost and CCA. On the other hand, Saiha received the least.
- There is no significant difference among districts for average unit cost and CCA per scheme.



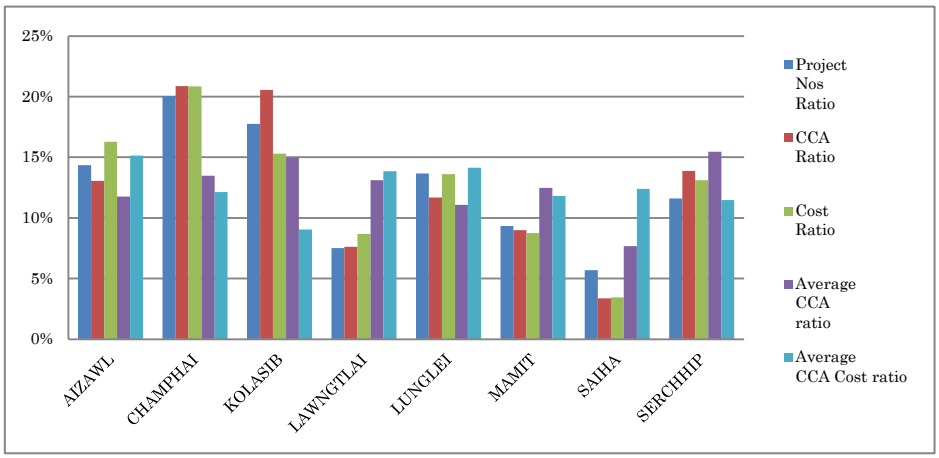
Source: Inventory survey 2013, MID

Figure 4.3.4 Cost and Development Area under the MID



Source: Inventory survey 2013, MID

Figure 4.3.5 Average Unit Cost and CCA per Scheme



Source: Inventory survey 2013, MID

Figure 4.3.6 District-wise MID Project Figures

Table 4.3.9 District-wise MID Project Figures

District	No. Projects	Project No, Ratio	CCA (ha)	CCA Ratio	Cost (Lakh)	Cost Ratio	Average CCA (ha)	Average CCA ratio	Average CCA Cost (Lakh)	Average CCA Cost ratio
AIZAWL	63	14%	2,379	13%	5,375	16%	38	12%	2.26	15%
CHAMPHAI	88	20%	3,806	21%	6,886	21%	43	13%	1.81	12%
KOLASIB	78	18%	3,745	21%	5,050	15%	48	15%	1.35	9%
LAWNGTLAI	33	8%	1,387	8%	2,868	9%	42	13%	2.07	14%
LUNGLEI	60	14%	2,129	12%	4,493	14%	35	11%	2.11	14%
MAMIT	41	9%	1,639	9%	2,892	9%	40	12%	1.76	12%
SAIHA	25	6%	615	3%	1,137	3%	25	8%	1.85	12%
SERCHHIP	51	12%	2,528	14%	4,328	13%	50	15%	1.71	11%
Total	439	100%	18,228	100 %	33,028	100 %	321	100%	15	100%

Source: Inventory survey 2013, MID

(b) Findings from Inventory Survey

1) General Features

- WUA does not have accurate information about catchment area, discharge volume, IPC and

GCC.

- As for accessibility to site, only 36% of schemes have all-season road, and 62% has seasonal road, and 2% do not have serviceable road.
- As for other usage of irrigation water, fisheries account for 150 schemes (40%), while domestic usage accounts for 83 schemes (22%). It is said that profit from fisheries is much bigger than profit from paddy irrigation.
- About 80% of schemes irrigate paddy fields and 13% of schemes are non-functional (damaged or ongoing). It is expected that about 7% of schemes are used for horticulture and irrigating other crops.

2) Gap Between DPR and Actual

- There is a gap between CCA of DPR and survey result. The survey results show that only 31% of the CCA schemes are more than the DPR plan, and the average CCA ratio (survey result/DPR) is 77% while 17% of the schemes are less than 50%. Therefore, it is expected that total existing CCA of Mizoram is about 13,000 ha, which is 70% of DPR information (18,228 ha).
- There is a gap between IPC of DPR and the survey results. The survey results show that the average cultivated area in the dry season is about 2.6 ha, which is 6% of 18,228 ha. Therefore, it is expected that total existing IPC of Mizoram is about 19,300 ha (18,228× 106%), which is 51% of DPR's IPC information (37,730ha). From the survey results, it is shown that shortage of irrigation water is the main reason for the gap.
- There is a gap about the length of canal lining between DPR and survey results. The survey results show that the average length of existing canal is about 86% of the DPR plan.

3) Constraints

- Sufficiency of irrigation water was surveyed through interviews. Season-wise sufficient rate is: kharif at 72%, rabi at 14%, and summer at 8%. It was found that about 30% of schemes need more water even during kharif season and cultivatable area is very limited during dry season.
- As for pump facilities, 10% of schemes have pumping facilities which were provided by the MID. These pumps are used for boosting and supplementary purposes.
- As for micro irrigation, 5% of schemes have micro irrigation facilities like drip, sprinkler, etc.
- 70% of schemes consider rehabilitation (big or small) as necessary, especially canal and intake facilities.
- As for flood damage, 52 schemes (16%) have permanent damage, 162 (48%) have temporary damage.
- As for WUA, the existence of 288 WUAs was confirmed but 18 schemes do not have WUA. Average WUA membership is 19 persons. Majority of WUAs have 10 to 15 members (23%).
- Survey result shows that only 26 out of 374 WUAs (7%) collect water use fees from their members regularly.

4) Needs and Requirements

- As for agriculture inputs, survey result shows that less than 20% of WUAs have fertilizer and pesticide inputs and only 48% of WUAs have received agriculture extension service.
- As for scheme needs for assistance, it was found that there is a large requirement for irrigation infrastructure and access road. However, needs for postharvest facilities and marketing are relatively low.

(3) Facts of Existing Irrigation Schemes in Eight Districts

(a) Mamit

Mamit is a new district of Mizoram with an area of 3,025.75 km^2. It is situated between 23°15'-24°15' N latitude and 92°15'-92°40' E longitude with an altitude ranging from 40 to 1,485 m AMSL. The district

is bisected by a few mountain ranges which run parallel to each other in a north-south fashion. The area is characterized mainly by three main ridgelines and intervening valleys and less prominent ridges. The drainage system of Mamit as a whole is dendritic in nature and the streams are young with deep courses.

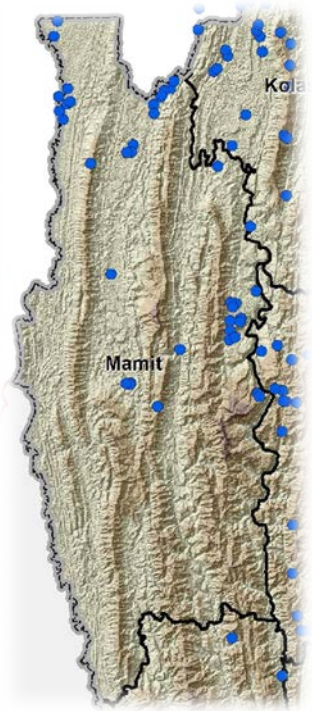
It can be said that most of the wet rice cultivation areas are found at the banks of the Teirei and Langkaih rivers, which eventually irrigates the paddy fields either directly or through its tributaries. In this case, river water is diverted to the paddy fields through channels.

The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.

Table 4.3.10 Abstract of MID Projects in Mamit

Type of Scheme	No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
River diversion	41	1,764	1,639	40	289,156,700	176,423

Source: Inventory Survey 2013, MID



Source:Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.7 MIP Project Locations

Table 4.3.11 Abstract of Inventory Survey Results

Total valid responses	31
No. of ongoing schemes	Nil
Accessibility to site	All seasons: 9, Seasonal: 20, No: 1
CCA Area	Average altitude of CCA : 181 m Valid responses：13 Survey result/DPR average：73%、 Survey result/DPR average (100%～)：3/13 = 23% Survey result/DPR average (50～100%)：8/13 = 62% Survey result/DPR average (～50%)：2/13 = 15%
Irrigated paddy	No. of schemes: 21 out of 31 (68%)
Other major crops in kharif	Valid responses:11, Average area: 2.20 ha Maize: 9/31 = 29%, Chilli: 7/31 = 23%, Brinjal: 7/31 = 23%, other vegetables: 5/31 = 16%
Other major crops in rabi	Valid responses: 17, Average area: 2.53 ha Mustard: 9/31 = 29%, Peas: 10/31 = 32% Beans: 8/31 = 26%, other vegetables: 8/31 = 26%
Other usage of irrigation water	Fishery: 17/31 = 55%, Domestic: 15/31 = 48%
Actual lined canal length (DPR/Survey result)	Average ratio：49%
Sufficiency of water (Sufficient percentage)	Rabi: 21%, Kharif: 93% , Summer: 4.5%
Irrigation facilities	Scheme with pump: 2 (6%) Scheme with micro irrigation: 0 (0%) Scheme with storage tank: 23 (74%)
Needs for rehabilitation	No. of needed schemes: 27 (87%) Diversion weir: 13/31 = 42%, Average estimated repair cost: Rs. 2.5 lakh Gate: 9/31 = 29%, Average estimated repair cost: Rs. 0.6 lakh Canal: 23/31 = 74%, Average estimated repair cost: Rs. 8.6 lakh

Type of flood damage	Permanent: 14/31 = 45%, Temporary: 3/31 = 10%, Never: 14/31 = 45%
WUA conditions	Valid responses: 7, Average no of WUA members: 17 persons No. of WUA collecting fees：Nil (0%) Average WUA collected fees： Rs. 0/year Active WUA: 0, Not so active: 12, No WUA: 19
WUA O/M conditions	Satisfactory : 4%, Medium: 26% , Poor: 70% Sediment problems: 10/31 = 32% Landslide problems: 25/31 = 81% Damaged: 8/31 = 26%
Agriculture input	Fertilizer: 20/31 = 25%, Pesticides: 16/31 = 62%, Farm machineries: 26/31 = 84 , Animal ploughs: 29/31 = 94% Extension service: 77% received, No: 23% Agriculture loan : 0 received, No: 100%
Needs for assistance (1-5 ranking)	Irrigation: 1.8, Road: 3.4, Flood: 3.7, Postharvest: 3.5, Marketing: 3.9

Source: Inventory Survey 2013, MID

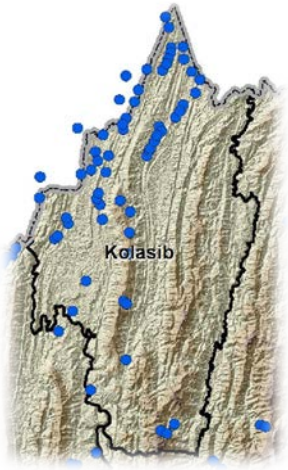
(b) Kolasib

The total geographical area of Kolasib District is 138,251 ha, which is about 15.5% of the state area of Mizoram. Also, the elevation ranges between 36–900 m AMSL. Many minor irrigation facilities have been developed. There are a number of MID projects in places such as Buchangphai, Chemphai, Chawnpui, Saiphai, and Bairabi. In these schemes, double cropping system are practiced during rabi and kharif seasons particularly in paddies, maize and many vegetables are grown in considerable scale, according to the Comprehensive District Agriculture Plan. The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.

Table 4.3.12 Abstract of MID Projects in Kolasib

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
78	4,101	3,745	48	505,001,290	134,847

Source: Inventory Survey 2013, MID



Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.8 MIP Project Locations

Table 4.3.13 Abstract of Inventory Survey Results

Total valid responses	75
No of ongoing schemes	Nil
Accessibility to site	All seasons: 30, Seasonal: 44, No: 0
CCA Area	Average altitude of CCA : 136 m Valid responses：53 Survey result/DPR average：90%、 Survey result/DPR average (100%～)：38/53 = 72% Survey result/DPR average (50～100%)：13/53 = 25% Survey result/DPR average (～50%)：2/53 = 3%
Irrigated paddy	No. of schemes: 75 out of 75 (100%)
Other major crops in kharif	Valid responses: 0, Average area: 0
Other major crops in rabi	Valid responses: 75, Average area: 2.3 ha, Mustard: 33/75 = 44%, Potato: 34/75 = 45%, Beans: 55/75 = 73%, Cabbage: 40/75 = 53%, other vegetables: 11/17 = 16%
Other usage of irrigation water	Fishery: 51/75 = 68%, Domestic: 20/75 = 27%
Actual lined canal length (DPR/Survey result)	Average ratio：97%
Sufficiency of water	Rabi: 7%, Kharif: 48%, Summer: 6%

(sufficient percentage)	
Irrigation facilities	No. schemes with pump: 23 (30.6%) No. of schemes with micro irrigation: 0 (0%), No. schemes with storage tank: 59 (78.60%)
Needs for rehabilitation	No. of needed schemes : 55 (73%) Diversion weir: 24/75 = 32%, Average estimated repair cost: Rs. 1.1 lakh Gate: 8/75 = 11%, Average estimated repair cost: Rs. 0.7 lakh Canal: 43/75 = 57%, Average estimated repair cost: Rs. 1.8 lakh
Type of flood damage	Permanent: 11/75 = 15%, Temporary: 54/75 = 72%, Never: 6/75 = 8%
WUA conditions	Valid responses: 74, Average no of WUA members：19 persons No. of WUA collecting fees：Nil (0%), Average WUA collected fees： Rs.0 /year Active WUA: 21, Not so active: 45, No WUA: 8
WUA O/M conditions	Satisfactory: 9%, Medium: 39% , Poor: 52%, Sediment problems: 43/75 = 57% Landslide problems: 50/75 = 67%, Damaged: 30/75 = 40%
Agriculture input	Fertilizer: 12/75 = 16%, Pesticides: 2/75 = 3%, Farm machineries: 25/75 = 33%, Animal plough: 69/75 = 92% Extension service: 86% received, No: 14%, Agriculture loan: 0 received, No:100%
Needs for assistance (1-5 ranking)	Irrigation: 1.64, Road: 2.65, Flood: 2.87, Postharvest: 4.03, Marketing: 4

Source: Inventory Survey 2013, MID

(c) Aizawl

The total geographical area of Aizawl District is 346,721 ha, which is about 16 % of the state area of Mizoram. Though the district mainly comprises of hilly terrain, there are a few pockets of low-lying valley landswhere altitude is rather low, having warm and humid climate facilitating paddy field cultivation.

The altitude ranges between 100 m to 1500 m in the district. The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.

Table 4.3.14 Abstract of MID Projects in Aizawl

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
63	2,561	2,379	38	537,457,200	225,917

Source: Inventory Survey 2013, MID

Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.9 MIP Project Locations

Table 4.3.15 Abstract of Inventory Survey Results

Total valid responses	65
No of ongoing schemes	9
Accessibility to site	All seasons: 7, Seasonal: 25, No: 1
CCA Area	Average altitude of CCA : 586 m Valid responses：8 Survey result/DPR average：59%、 Survey result/DPR average (100%～)：0/8 = 0% Survey result/DPR average (50～100%)：7/8 = 87.5% Survey result/DPR average (～50%)：1/8 = 12.5%
Irrigated paddy	No. of schemes: 48 out of 65(73.8%)
Other major crops in kharif	Valid responses: 9, Average area: 1.44 ha

	Pea and Bean: 5/65 = 8%, Mustard: 4/65 = 6%, other vegetables: 11/65 = 17%
Other major crops in rabi	Valid responses: 35, Average area: 2.3 ha Mustard: 24/65 = 37%, Peas and Beans: 10/65 = 16%, Vegetables: 11/65 = 17%
Other usage of irrigation water	Fishery: 21/65 = 32%, Domestic: 14/65 = 22%
Actual lined canal length (DPR/Survey result)	Average ratio：58%
Sufficiency of water (Sufficient percentage)	Rabi:15%, Kharif:64% , Summer: 17%
Irrigation facilities	No. of schemes with pump: 2 (3%) No. of schemes with micro irrigation: 8 (12.3%) No. of schemes with storage tank: 51 (78.5%)
Needs for rehabilitation	No. of needed schemes: 41 (63%) Diversion weir: 27/65 = 42%, Average estimated repair cost: Rs. 1.4 lakh Gate: 16/65 = 25%, Average estimated repair cost: Rs. 0.9 lakh Canal: 33/65 = 51%, Average estimated repair cost: Rs. 2.2 lakh
Type of flood damage	Permanent: 8/65 = 12%, Temporary: 15/65 = 23%, Never: 30/65 = 46%
WUA conditions	Valid responses:62, Average No of WUA members：22 persons No. of WUA collecting fees：Nil (0%), Average WUA collected fees：Rs. 0/year Active WUA: 51, Not so active: 7, No WUA: 4
WUA O/M conditions	Satisfactory: 43%, Medium: 52% , Poor: 4%, Sediment problems: 36/65 = 55% Landslide problems: 51/65 = 78%, Damaged: 25/65 = 38%
Agriculture input	Fertilizer: 16/65 = 29%, Pesticides: 15/65 = 23%, Farm machineries: 36/65 = 55% , Animal ploughs: 27/65 = 42%, Extension service: 68.5% received, No: 32% Agriculture loan: 9% received, No: 91%
Needs for assistance (1-5 ranking)	Irrigation: 2.3, Road: 2.84, Flood: 3.65, Postharvest: 4.57, Marketing: 4.85

Source: Inventory Survey 2013, MID

(d) Champhai

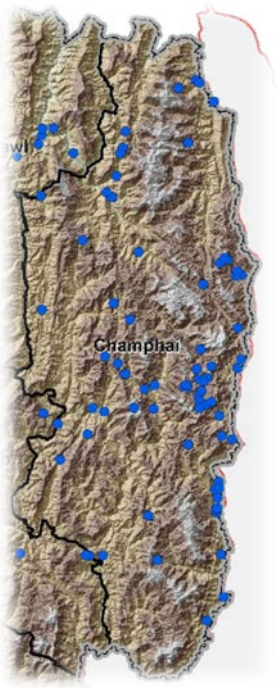
Champhai District is bounded on the north by Churachandpur District of Manipur State, on the west by Aizwal and Serchhip districts, and on the south and east by Myanmar. It is located on the Indo-Myanmar border and is situated in a strategically important location. Because of this, it is the main business corridor for India and Myanmar in the area. The area of Champhai is 3,185.83 km^2. The average annual rainfall is 1,814 m.

The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.

Table 4.3.16 Abstract of MID Projects in Champhai

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
88	3,923	3,806	38	688,613,410	225,917

Source: Inventory Survey 2013, MID



Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.10 MIP Project Locations

Table 4.3.17 Abstract of Inventory Survey Results

Total valid responses	89
No of ongoing schemes	Nil
Accessibility to site	All seasons: 39, Seasonal: 39, No: 2
CCA area	Average altitude of CCA : 1066 m Valid responses：84

	Survey result/DPR average：71%、 Survey result/DPR average (100%～)：12/84 = 14.3% Survey result/DPR average (50～100%)：61/84 = 72.6% Survey result/DPR average (～50%)：11/84 = 13.1%
Irrigated paddy	No. of schemes: 80 out of 89 (90%)
Other major crops in kharif	Valid responses: 13, Average rea: 6.0 ha Grape: 6/89 = 7%, Mustard: 3/89 = 3%, other fruits: 2/89 = 2%, Banana: 2/89 = 2%
Other major crops in rabi	Valid responses: 9, Average area: 1.56 ha Mustard: 7/89 = 8%, Beans: 1/89 = 1%, Vegetables: 3/89 = 3%
Other usage of irrigation water	Fishery: 20/89 = 22%, Domestic: 6/89 = 7%
Actual lined canal length (DPR/Survey result)	Average ratio：96%
Sufficiency of water (sufficient percentage)	Rabi: 6%, Kharif: 95% , Summer: 0%
Irrigation facilities	Scheme with pump: 6 (7%) Scheme with micro irrigation: 5 (6 %) Scheme with storage tank: 51 (57%)
Needs for Rehabilitation	No. of needed schemes: 58 (65%) Diversion weir: 31/89 = 35%, Average estimated repair cost: Rs. 3.0 lakh Gate: 2/89 = 2%, Average estimated repair cost: Rs. 1.6 lakh Canal: 51/89 = 57%, Average estimated repair cost: Rs. 3.2 lakh
Type of flood damage	Permanent: 7%, Temporary: 70%, Never: 23%
WUA conditions	Valid responses: 86, Average No of WUA members：22 persons No. of WUA collecting fees：3 (3%) Average WUA collected fees：Rs. 900/year Active WUA: 78, Not so active: 8, No WUA: 0
WUA O/M conditions	Satisfactory: 34%, Medium: 66%, Poor: 0 Sediment problems: 56/89 = 63% Landslide problems: 15/89 = 17% Damaged: 6/89 = 7 %
Agriculture input	Fertilizer: 6/89 = 7%, Pesticides: 7/89 = 8% , Farm machineries: 39/89 = 44%, Animal ploughs: 72/89 = 81% Extension service: 7% received, No: 93% Agriculture loan : 0 received, No: 100%
Needs for assistance (1-5 ranking)	Irrigation: 1.9, Road: 3.5, Flood: 3.86, Postharvest: 5, Marketing: 5

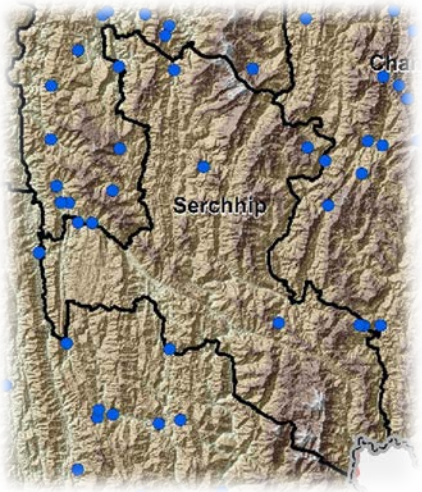
Source: Inventory Survey 2013, MID

(e) Serchip

Serchhip District is the smallest district of the state but enjoy the third position in the production of paddy next to Kolasib and Champhai. It is comprised of hilly terrain but has a good alluvial potential pocket of land on its river basins. The total geographical area is 1,421.6 km^2 accounting for 6.74% of the total geographical area of the state.

The minor irrigation projects completed in this district are gravity flow type of irrigation in low lying areas where paddy are grown. The source of water is mainly from river diversion, which is active only during the monsoon season. Many streams dries up immediately after rains stop falling. Therefore, the cropping intensity is always limited to 125% in the alluvial flat lands. Open-well irrigation is not yet used in these potential flat land although ground water recourse are available. (Source: Comprehensive District Agriculture Plan)

The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.



Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.11 MIP Project Locations

Table 4.3.18 Abstract of MID Projects in Serchhip

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
51	2,680	2,528	38	432,804,107	225,917

Source: Inventory Survey 2013, MID

Table 4.3.19 Abstract of Inventory Survey Results

Total valid responses	5 Note: survey work delayed
No of ongoing schemes	Nil
Accessibility to site	All seasons: 1, Seasonal: 3, No: 0
CCA area	Average altitude of CCA : 1,750 m Valid responses： 3 Survey result/DPR average：45%、 Survey result/DPR average (100%～)：0/3 = 0 Survey result/DPR average (50～100%)：2/3 = 66.7% Survey result/DPR average (～50%)：1/3 = 33.3%
Irrigated paddy	No. of schemes: 5 out of 5 (100%)
Other major crops in kharif	Valid responses: 5, Average area: 15.94 ha Paddy: 5/5 = 100%
Other major crops in rabi	Valid responses: 4, Average area: 1.36 ha Mustard: 1/5 = 20 %, Vegetables: 3/5 = 60%, Cauliflower: 1/5 = 20%, Orange 2/5 = 40% Beans: 1/5 = 20%
Other usage of irrigation water	Fishery: 1/5 = 20%, Domestic: 0
Actual lined canal length (DPR/Survey result)	Average ratio：53%
Sufficiency of water (sufficient percentage)	Rabi: 25%, Kharif: 40% , Summer: 20%
Irrigation facilities	No. of schemes with pump: 0 (0%) No. of schemes with micro irrigation: 0 (0%) No. of schemes with storage tank: 2 (40%)
Needs for rehabilitation	No. of needed schemes: 5 (100%) Diversion weir: 4/5 = 20%, Average estimated repair cost: Rs. 3.075 lakh Gate: 4/5 = 80%, Average estimated repair cost: Rs. 0.4 lakh Canal: 4/5 = 80%, Average estimated repair cost: Rs. 1.075 lakh
Type of flood damage	Permanent: 1/5 = 20%, Temporary: 3/5 = 60%, Never: 1/5 = 20%
WUA conditions	Valid responses: 5, Average No of WUA members：12 persons No. of WUA collecting fees：Nil (0%) Active WUA: 3, Not so active: 2, No WUA: 0 No. of WUA collecting fees：0 (0%) Average WUA collected fees：Rs. 0/year
WUA O/M conditions	Satisfactory: 40%, Medium: 40%, Poor: 20% Sediment problems: 3/5 = 60% Landslide problems: 3/5 = 60% Damaged: 1/5 = 20%
Agriculture input	Fertilizer: 0, Pesticides: 0, Farm machineries: 0, Animal ploughs: 5/5 = 100% Extension service: 80% received, No: 20% Agriculture loan: 0 received, No: 100%
Needs for assistance (1-5 ranking)	Irrigation: 2, Road: 2.2, Flood: 3.6, Postharvest: 2.4, Marketing: 2

Source: Inventory Survey 2013, MID

(f) Lunglei

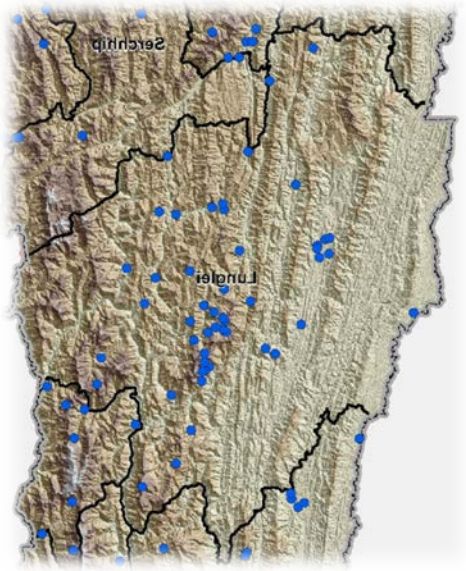
Lunglei District, the biggest district in Mizoram, is bounded on the north by Mamit and Serchhip districts, on the south by Lawngtlai and Saiha districts, on the east by Myanmar and on the west by Bangladesh. It has an area of 4,538 km^2 and 186 villages. Lunglei town is the administrative headquarters of the district.

The normal way of irrigation in the district is by diverting small streams. In other areas, irrigation is provided from natural sources only during rainy months. The hydro-geomorphology of the region is such that groundwater resources cannot be easily utilised for irrigation purposes. The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.

Table 4.3.20 Abstract of MID Projects in Lunglei

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
60	2,644	2,129	35	449,296,153	211,036

Source: Inventory Survey 2013, MID



Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.12 MIP Project Locations

Table 4.3.21 Abstract of Inventory Survey Results

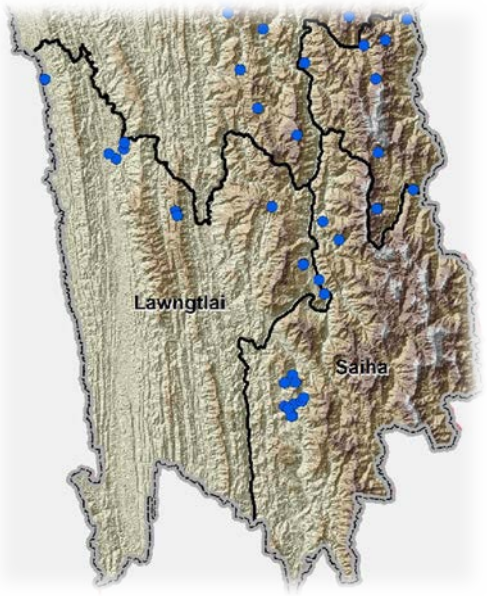
Total valid responses	60
No of ongoing schemes	5
Accessibility to site	All seasons: 14, Seasonal: 31, No: 3
CCA area	Average altitude of CCA : 540 m Valid responses：53 Survey result/DPR average：66% Survey result/DPR average (100%～)：6/53 = 11.3% Survey result/DPR average (50～100%)：33/53 = 62.2% Survey result/DPR average (～50%)：14/53 = 26.41%
Irrigated paddy	No. of schemes: 39 out of 60 (65%)
Other major crops in kharif	Valid responses:12, Average Area:2.79ha Maize:6/60=10%, Vegetables:1/60=2%, Mustard:3/60=5%,
Other major crops in rabi	Valid responses: 36, Average area: 1.29 ha Mustard: 34/60 = 57%, Peas and Beans: 13/60 = 22%, Vegetables: 17/60 = 28%
Other usage of irrigation water	Fishery: 20/60 = 33%, Domestic: 13/60 = 22%
Actual lined canal length (DPR/Survey result)	Average ratio：72%
Sufficiency of water (sufficient percentage)	Rabi: 35%, Kharif: 79% , Summer: 11%
Irrigation facilities	No. of schemes with pump: 2 (3%) No. of schemes with micro irrigation: 8 (13%) No. of schemes with storage tank: 48 (80%)
Needs for Rehabilitation	No. of needed schemes : 42 (70%) Diversion weir: 26/60 = 43%, Average estimated repair cost: Rs. 1.42 lakh Gate: 21/60 = 35%, Average estimated repair cost: Rs. 0.69 lakh Canal: 28/60 = 47%, Average estimated repair cost: Rs. 2.02 lakh
Type of flood damage	Permanent: 9/60 = 15%, Temporary: 14/60 = 23%, Never: 27/60 = 45%

WUA conditions	Valid responses: 51, Average no. of WUA members：15 persons No. of WUA collecting fees：14 (27.5%), Average WUA collected fees：Rs. 9,214/year Active WUA: 23, Not so active: 7, No WUA: 21
WUA O/M conditions	Satisfactory: 19%, Medium: 38%, Poor: 42.9% Sediment problems: 22/60 = 37% Landslide problems: 24/60 = 40% Damaged: 17/60 = 28%
Agriculture input	Fertilizer: 13/60 = 22%, Pesticides: 12/60 = 20%, Farm machineries: 14/60 = 23%, Animal ploughs: 12/60 = 20%, Extension service: 49% received, No: 51 Agriculture loan : 0 received, No: 100%
Needs for assistance (1-5 ranking)	Irrigation: 1.62, Road: 1.67, Flood: 3.22, Postharvest: 4.67, Marketing: 4.34

Source: Inventory Survey 2013, MID

(g) Lawngtlai

Lawngtlai District is located in the southwest part of Mizoram having international boundaries with Bangladesh in the west and Myanmar in the east. Lunglei and Saiha district bounds the district in the north and south, respectively. Lawngtlai District covers an area of 2,557 km^2. The major land use identified within Lawngtlai District are built up land and agriculture land. Forest, water bodies and other (current shifting cultivation) wetland rice cultivation is practiced in the flood plain of the Chhimtuipui River, Tuichawng River, Ngengpui River and Thega River. Orya sativa is the only crop cultivated during the kharif season. During rabi season, some vegetables like mustards, cauliflowers, etc., are cultivated in small patches of the valley field in a scattered manner. Agriculture/horticulture plantations such as oranges, bananas, and pineapples have been practiced near habitation in various places.



Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.13 MIP Project Locations

Agriculture in the district depends mainly on rainfall. Major rivers such as Tuichawng, Chhimtuipui and Thega and minor rivers such as Dil Lui, Sekulh and Chikhur Lui flow through the district. Due to her topography, only minor irrigation is feasible. The area has rainfall and exploitation of ground water resource is still inadequate. (Source: Comprehensive District Agriculture Plan) The following tables show the abstract of irrigation projects which were conducted by the MID and the abstract of inventory survey results.

Table 4.3.22 Abstract of MID Projects in Lawngtlai

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
33	1,406	1,387	42	286,805,900	206,781

Source: Inventory Survey 2013, MID

Table 4.3.23 Abstract of Inventory Survey Results

Total valid responses	31
No of ongoing schemes	2
Accessibility to site	All seasons: 7, Seasonal: 11, No: 0
CCA Area	Average altitude of CCA : 557 m Valid responses：28 Survey result/DPR average：87%, Survey result/DPR average (100%～)：9/28 = 32.14% Survey result/DPR average (50～100%)：16/28 = 57.14%

	Survey result/DPR average (～50%)：3/28 = 10.71%
Irrigated paddy	No. of schemes: 15 out of 31 (48%)
Other major crops in kharif	Valid responses: 0, Average Area: 0
Other major crops in rabi	Valid responses: 8, Average area: 1.3 ha Mustard: 6/31 = 19%, Peas and Beans: 6/31 = 19%, Cabbage: 3/31 = 10%
Other usage of irrigation water	Fishery: 18/31 = 58%, Domestic: 18/31 = 58%
Actual lined canal length (DPR/Survey result)	Average ratio：80%
Sufficiency of water (sufficient percentage)	Rabi: 11%, Kharif: 53%, Summer: 11%
Irrigation facilities	No. of schemes with pump: 1 (17%), No. of schemes with micro irrigation: 1 (3%) No. of schemes with storage tank: 15 (48%)
Needs for rehabilitation	No. of needed schemes: 26 (84%) Diversion weir: 18/31 = 58%, Average estimated repair cost: Rs. 2.5 lakh Gate: 5/31 = 16%, Average estimated repair cost: Rs. 0.0 lakh Canal: 19/31 = 61%, Average estimated repair cost: Rs. 3.11 lakh
Type of flood damage	Permanent: 4/31 = 13%, Temporary: 9/31 = 29%, Never: 14/41 = 45%
WUA conditions	Valid responses: 24, Average no of WUA members：14 persons No. of WUA collecting fees：3 (13%), Active WUA: 15, Not so active: 3, No WUA: 6 Average WUA collected fees：Rs. 5,600/year
WUA O/M conditions	Satisfactory: 9%, Medium: 36% , Poor: 44%, Sediment problems: 19/31 = 61% Landslide problems: 23/31 = 74%, Damaged: 8/31 = 26%
Agriculture input	Fertilizer: 4/31=13%, Pesticides: 5/31 = 16%, Farm machineries: 4/31 = 13%, Animal ploughs: 10/31 = 32%, Extension service: 21% received, No:79%, Agriculture loan : 4% received, No: 96%
Needs for assistance (1-5 ranking)	Irrigation: 1.56, Road: 1.78, Flood: 3.11, Postharvest: 3.84, Marketing: 4.6

Source: Inventory Survey 2013, MID

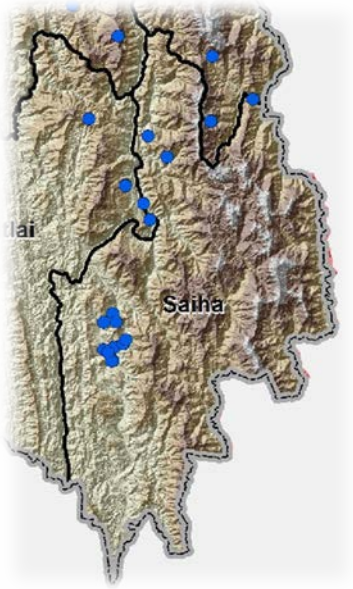
(h) Saiha

Saiha District was formerly part of Chhimtuipui District. Chhimtuipui District was split in half in 1998. The district area comes under the Mara Autonomous District Councils under the Sixth Schedule of the Constitution of India. It is bounded to the north and west by Lawngtlai District, and on the south and east by Myanmar. The total geographical rea is 1,965.82 km^2 which accounts for more than 6.64% of the total geographical area of the state. It has an average elevation of 729 m.

Table 4.3.24 Abstract of MID Projects in Saiha

No. of Schemes	GCA (ha)	CCA (ha)	Average CCA (ha)	Cost in Rs.	Unit Cost per CCA (Rs./ha)
25	696	615	25	113,702,809	184,883

Source: Inventory Survey 2013, MID



Source: Created based by the JICA Study Team upon data from the MID, ASTER GDEM is a product of METI and NASA

Figure 4.3.14 MIP projects Location

Table 4.3.25 Abstract of Inventory Survey Results

Total valid responses	20
No of ongoing schemes	Nil
Accessibility to site	All seasons: 2, Seasonal: 15, No: 0
CCA area	Average altitude of CCA : 271 m Valid responses：20 Survey result/DPR average：88%、 Survey result/DPR average (100%～)：11/20 = 55% Survey result/DPR average (50～100%)：7/20 = 35% Survey result/DPR average (～50%)：2/20 = 10%
Irrigated paddy	No. of schemes: 13 out of 20 (65%)
Other major crops in kharif	Valid responses: 1, Average area: 3.6 ha Tomato: 1/20 = 5%, Beans: 1/20 = 5%, Mustard: 1/20 = 5%
Other major crops in rabi	Fishery: 3/20 = 15%, Domestic: 1/20 = 5%
Other usage of irrigation water	Fishery: 15%, Domestic: 5%
Actual lined canal length (DPR/Survey result)	Average ratio：42%
Sufficiency of water (sufficient percentage)	Rabi: 9%, Kharif: 27% , Summer: 15%
Irrigation facilities	No. of schemes with pump: 0 (0%) No. schemes with micro irrigation: 0 (0%) No. of schemes with storage tank: 5 (25%)
Needs for rehabilitation	No. of needed schemes: 10/20 (50%) Diversion weir: 6/20 = 30%, Average estimated repair cost: Rs. 1.38 lakh Gate: 3/20 = 15%, Average estimated repair cost: Rs. 0.7 lakh Canal: 9/20 = 45%, Average estimated repair cost: Rs. 1.65 lakh
Type of flood damage	Permanent: 2/20 = 10%, Temporary: 5/20 = 25%, Never: 11/20 = 55%
WUA conditions	Valid responses: 19, Average no of WUA members：12 persons No. of WUA collecting fees：3 (16%) Average WUA collected fees：Rs. 1,800/year Active WUA:3, Not so active:3, No WUA: 13
WUA O/M conditions	Satisfactory: 0, Medium: 19%, Poor: 81% Sediment problems: 16/20 = 80% Landslide problems: 19/20 = 95% Damaged: 6/20 = 30%
Agriculture input	Fertilizer: 0, Pesticides: 0, Farm machineries: 0 ,Animal ploughs: 14/20 = 70% Extension service: 20% received, No: 80% Agriculture loan : 0 received, No: 100%
Needs for assistance (1-5 ranking)	Irrigation: 1.26, Road: 1.94, Flood: 3.37, Postharvest: 4.24, Marketing: 4.11

Source: Inventory Survey 2013, MID

4.3.6 Water Resources Management

(1) Existing Condition

- The MID has implemented 439 projects as of 2013 and most of the schemes are taking water from streams in which the river basin is smaller than a mini-watershed. A small number of schemes take water from rivers in which the river basin is larger than the level of 34 watersheds. Therefore, here in this clause, water management is to be considered and targeted in mini-watershed level or smaller.
- Legally, the PHED is in charge of water resource management in Mizoram and basically, the MID is to submit project application for irrigation water use. However, this procedure is not taken customarily for minor irrigations. In case the MID is to intake water from major rivers for further water resource development, the MID side has to take the necessary steps.
- River basin is to be classified into seven categories (from small to large scales).
- "Basin > Catchment > Sub-Catchment > Watershed > Sub-Watershed > Mini-Watershed > Micro- Watershed"

- As described in Section 4.1.5, the catchment area of Mizoram is divided into three, namely, the Barak River, the Kolodyne River and the Karnaphuli River. There are 7 subcatchments, 34 watersheds, and 2,405 micro-watersheds.
- Water balance calculation was conducted to understand the balance of river discharge and water requirements at the watershed level. The following can be said based from the calculations:
- Annual total discharge quantity is more than 50 times larger than the requirement in most of the watersheds.
- During kharif season, effective rainfall is more than irrigation requirement except for half a month or so.
- Even during the dry season, discharge quantity is more than the water requirement in most of the watersheds.
- It can be said that river water potential in Mizoram is high in watershed level. However, the MID schemes generally target mini-watersheds or smaller level streams. That is why many the MID schemes have water shortage problems.

(2) Requirement for Water Resources Management

- When it comes to small-scale water management, comprehensive approach is needed to make the most of limited water resources together with soil conservation management activities. The following are items to be considered in order to formulate small-scale water management plan:
- Forest preservation and afforestation in steep slope and erosion area.
- Promotion of managed jhum and agroforestry in relatively steep slope.
- Low sloped alluvial area is to be used for WRC and water storage farm pond should be set in upper stream part. Farm pond can be used for fishery purposes too.
- Horticulture can be promoted in gentle slope area together with terraced land and micro irrigation.
- Preservation of stream side forest for soil and water conservation.
- Data collection and accumulation of stream discharge, rainfall, domestic usage of water and amount of soil erosions.
- Construction of water harvesting tanks on slopes.
- Construction of check dams to prevent slope erosion.
- Construction of intake and irrigation facilities.
- Formulation of small watershed resources management group, including WUAs, the MID, villagers, relevant departments, and other existing groups.
- Subsidy system for soil and water management activities. Problems and Constraints for Development

(3) Findings from Inventory Survey Result

(a) Gap Between DPR and Actual

- There is a gap between CCA of DPR and survey result. The survey results show that only 31% of CCA schemes are more than DPR plan, and average CCA ratio (Survey result/DPR) is 77% and 17% of schemes are less than 50%. Therefore, it is expected that total existing CCA of Mizoram is about 13,000 ha, which is 70% of DPR information (18,228 ha).
- There is a gap between IPC of DPR and survey result. The survey results show that the average cultivated area during dry season is about 2.6 ha, which is 6% of 18,228 ha. Therefore, it is expected that the total existing IPC of Mizoram is about 19,300 ha (18228×106%), which is 51% of DPR's IPC information (37,730 ha). From the survey result, it is expected that shortage of irrigation water is the main reason of the gap.
- There is a gap about length of canal lining between the DPR and survey results. The survey results show that the average length of existing canal is about 86% of the DPR plan.

(b) Major Constraints

- Sufficiency of irrigation water was surveyed through interviews. Season-wise sufficient rate is: kharif at 72%, rabi at 14%, and summer at 8%. It was found that about 30% of schemes

need more water even during kharif season and cultivatable area is very limited during dry season.

- 70% of schemes consider rehabilitation (big or small) as necessary, especially canal and intake facilities.
- The survey result shows that more than half of schemes has experienced flood damages (permanent: 16%, temporary: 48%). It shows that more consideration to flood protection is needed at the time of facility planning and designing.
- The survey result shows that only 26 out of 374 WUAs (7%) collect water use fees from their members regularly.
- As for agriculture inputs, the survey result shows that less than 20% of WUAs have fertilizer and pesticide inputs and only 48% of WUAs have received agriculture extension service.

(4) Findings from Field Survey and Interviews.

(a) Problems of the MID

- Although the MID has prepared the 12th Plan, which shows the figures of future development area, a detailed concrete future plan, which includes development strategy, evaluation of potential area, development priorities, collaboration with relevant departments, etc., has not been prepared yet.
- Collaboration with relevant department projects are not considered enough. Some schemes' sites are overlapping each other.

(b) Problems of MID Projects

- Involvement of farmers and relevant departments is not enough throughout project planning and implementing procedures.
- DPR does not include analysis procedures on existing conditions and impact assessment on social, economic and environmental aspects and agriculture action plan.
- Quality and quantity control of construction works need to be strengthened.
- Income generation through agriculture is not big enough to enable farmers to live on. Therefore, most farmers also need to be engaged in other works.
- Although most MID projects are targeting WRC farming areas, much of the produced rice is for self-consumption, not for selling.

(c) Problems of O&M

- Majority of schemes need rehabilitation of irrigation facilities (big or small), although capacity of WUA is not enough for sustainable O&M activities. It is anticipated in the future that abandoned and uncultivated land area may increase.
- WUA problems include shortage of sense of ownership (dependency on public support is relatively strong), shortage of financial and technical capacity for sustainable irrigation activities, shortage of regulations which shows roles and responsibilities of members.
- Monitoring and evaluation system for project management, including feedback of the results, is not established.
- Although many schemes need repair or rehabilitation of irrigation facilities, central sponsored schemes such as AIBP basically cannot be applied to repair or rehabilitation projects. Therefore, the MID depends on small state government budget for the work.

(d) Others

- Legally, PHED is in charge of water resource management in Mizoram, and basically the MID is to submit project application for irrigation water use. However, this procedure is not taken customarily for minor irrigations.
- Some farmers mentioned about health problem of paddy field work. It may be connected with the schistosomiasis problem in the region.
- A large number of potential WRC development sites are located along rivers and are overlapping with forest reserves. This aspect has been handled properly so far. However, special consideration is necessary in cases of relatively large areas where development is planned within the designated area.

4.4 Agricultural Support Services

4.4.1 Policy, Institution, and Plan

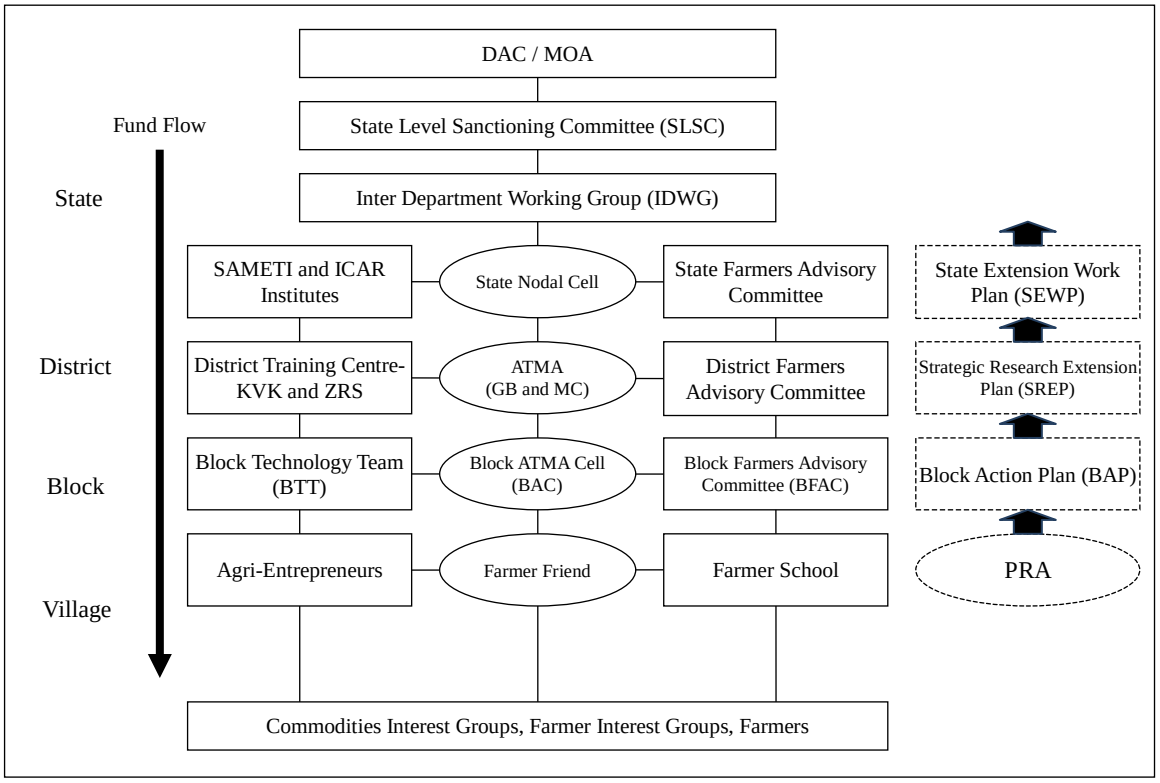
(1) National Policies and Institutions

Agriculture development in India is the responsibility of the state government. Nevertheless, the GOI plays a major role in formulating policies that have direct bearing on the growth of the agricultural sector, and mainly provides a road map through its policies, programmes, and budgetary support to the sector. The programmes conceived at the national level are mainly implemented by the states through its line departments. Of the three departments of the Ministry of Agriculture (MOA), two departments, i.e. the Department of Agriculture and Cooperative (DAC) and the Department of Agriculture Research and Education (DARE), are the responsible bodies for agricultural support services at the national level. The departments have developed and are engaged in two flagship supporting programmes, namely, the Indian Council of Agricultural Research (ICAR), and the Agricultural Technology Management Agency (ATMA), as outlined below.

ICAR under the DARE is an apex body at the national level that supports research and extension activities. State agricultural universities are also contemplating to develop extension models suitable to take up transfer of technology besides implementing the models developed by the ICAR system. The Krishi Vigyan Kendra (KVK), or "Farm Science Centre" developed by ICAR is a prime programme for farmers to know about agricultural technologies being generated by the National Agricultural Research System (NARS). KVK is usually established at the district level of each state and works at the grassroots level as a vocational training institution in order to bridge the gap between the available technologies and their applications, and to increase production and productivity. Although, the technical expertise lies in the NARS (ICAR and state agricultural universities), and their services are not able to reach a reasonable expected scale with the limited staff in each district so far.

The ATMA was set by the DAC as a new extension system to converge and integrate extension activities at the district level and through a participatory approach. It is a major reform in agricultural extension and in collaboration with ICAR / KVK. The ATMA reforms for agricultural extension were implemented as part of the World Bank-funded innovations in the technology dissemination component of the National Agricultural Technology Project. After that, the ATMA expanded to all the districts of India during the 11th Five-Year Plan period. The ATMA is a registered society at the district level. The district extension activities are based on a Strategic Research and Extension Plan (SREP) prepared using participatory rural appraisal (PRA) for each district. The district and block level structures give higher emphasis on incorporating the ICAR institutes, such as KVKs and zonal research stations (ZRS). At the block level, the Block ATMA Cell (BAC) is the physical platform where the Block Technology Team (BTT) and Block Farmers Advisory Committee (BFAC) meet to prepare the Block Action Plan (BAP) and implement extension activities.

The block to village extension link is formally institutionalised through the concept of a “farmer friend” (FF) for every two villages. In each state, a state Agriculture Management and Extension Training Institute (SAMETI) is established. This institute provides training and undertakes human resources development based on the concept of the ATMA for junior- and middle-level extension functionalities. The current performance of the ATMA at all of these levels varies from state to state. The ATMA has expanded the range of its extension activities (field technology demonstrations, farmer trainings, study tour, farm schools, exhibitions and farmer-scientist interaction) at the district and block levels. The flow chart of the AMTA’s activities is shown in Figure 4.4.1.



Source: Prepared by the JICA Study Team based on DAC ATMA in Phase II

Figure 4.4.1 ATMA (Phase II) Organisation and Activities Flow Chart

(2) Outline of Agricultural Support Services in Mizoram

The services institutionally provided by the state are (i) research and education, (ii) agricultural extension technology, (iii) seed multiplication, (iv) provision of agro-machinery, (v) market information, (vi) agricultural credit, and (vii) cooperatives. These agricultural support services, excluding agricultural credit and cooperatives, are handled by the four agro-allied departments, i.e., DOA (CH), DOA (R&E), DOH and DSWC. The roles and functions of the four departments in agricultural support services are outlined in Table 4.4.1.

Table 4.4.1 Outline of Agricultural Support Services Provided by Agro-allied Departments

Description	DOA (CH)	DOA (R&E)	DOH	DSWC
General Roles on Agricultural Support Services	・ Provide technical know-how ・ Supply inputs and services	・ Transfer improved agricultural technology	・ Disseminate new technologies in horticulture farming	・ Promote proper land use through soil and water conservation
Research and Education	・ Entrust DOA (R&E)	・ Undertake research works and on-farm trial on food and horticulture crops, livestock, and livelihood improvement at KVK	・ No research activities ・ Collaborate with ICAR and KVK, however, there is virtually no progress so far	・ Entrust research works on coffee and rubber to the Coffee Board and the Rubber Board
Extension of Technology	・ Undertake training and field demonstrations ・ Manage the ATMA deployed in eight districts	・ Undertake training at the integrated training centre ・ Demonstrate outcomes from on-farm trial at KVKs ・ Train and educate farmers at KVKs	・ No specific schemes for extension services ・ Provide farmers with technical guidance by horticulture officers at circle offices	・ No specific schemes for extension services ・ Distribute nursery stocks of coffee and rubber, subject to technical guidance by the Coffee and Rubber Boards

Description	DOA (CH)	DOA (R&E)	DOH	DSWC
Seed Multiplication	・ Produce certified seeds including sugarcane	・ Produce certified and improved seeds at the experiment farm and KVKs	・ Produce fruits' nursery stock ・ Try tissue culture of banana (no function yet)	・ Produce nursery stock of rubber and coffee
Provision of Agro-machinery	・ Provide farmers with subsidy for buying tractor, plowing machinery, etc.	・ NA	・ Provide farmers with subsidy for buying mini-plowing machine	・ NA
Market Information	・ NA	・ NA	・ Facilitate market infrastructure by centrally sponsored scheme (CSS) fund, but no market information	・ NA
Agricultural Credit	・ Provide subsidy, but no credit	・ NA	・ Provide subsidy, but no credit	・ NA
Cooperative (Farmers' organisation)	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation

Source : JICA Study Team

4.4.2 Activities of Agro-allied Departments

(1) Department of Agriculture (CH and R&E)

There are two directorates, i.e., i) Crop Husbandry (CH), and ii) Research and Education (R&E), under the DOA, and each directorate implements agricultural extension and advisory services. As mentioned above, the extension activities and other supporting services will be implemented with the ATMA system in collaboration with KVK. However, systems and functions are not yet fully established. At present, the agricultural support programmes as shown in Table 4.4.2 are implemented through the DOA.

Table 4.4.2 Agricultural Support Programmes Implemented by the DOA

Programme	Objectives and Details
EXTENSION	
Establishment of Agricultural Clinic and Agricultural Business Centre	・ To provide extension services to farmers on payment basis through setting up of economically viable self-employment ventures
Mass Media Support to Agricultural Extension	・ To provide agricultural information and knowledge to farmers using infrastructure of Doordarshan and All India Radio
INFORMATION TECHNOLOGY	
Strengthening/Promoting Agricultural Information System	・ To promote e-governance in agriculture at the centre, and to provide support to the states
INTEGRATED NUTRIENT MANAGEMENT	
National Project on Management of Soil Health and Fertility	・ To facilitate and promote integrated nutrient management (INM) through judicious use of chemical fertilizers, including secondary and micronutrients, in conjunction with organic manure and bio-fertilizer for improving soil health and productivity ・ To promote the use of organic manure, soil amendments and micronutrients for improving soil fertility, crop productivity, etc.
National Project on Organic Farming	・ To promote production, promotion, and market development of organic farming in the country
MECHANISATION and TECHNOLOGY	
Postharvest Technology	To train farmers on the use and maintenance of equipment for postharvest and by-product

and Management	management, to train manufacturers of agricultural machinery in order to encourage them to take up commercial production of the technologies developed through the ICAR/CSIR institutions, and to train scientists of AICRP and KVKs
SEED	
Development and Strengthening of Infrastructure facilities for Production and Distribution of Quality Seeds	Upgrading of infrastructure facilities for production and distribution of quality seeds
CREDIT	
National Agriculture Insurance Scheme	・ To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crops as a result of natural calamities, pests, or diseases. ・ To encourage the farmers to adopt progressive farming practices, high value inputs, and higher technology in agriculture. ・ To help stabilise farm incomes, particularly in disaster years.
Pilot Weather Based Crop Insurance Scheme	To provide insurance protection to farmers against adverse weather incidences, such as deficit and excess rainfall, frost (low temperature), heat (high temperature), relative humidity, which are deemed to impact crops adversely during their cultivation period

Source : DOA

The DOA (R&E) is looking after innovative science-based institutions that undertake vocational training for male and female farmers, rural youth, etc. The institutions under the directorate are also engaged in conducting on-farm research for technology refinement and front line demonstrations to promptly disseminate the latest agricultural technologies to the farmers as well as the extension workers. Training in these institutions was imparted through the learning process of 'teaching by doing' and 'learning by doing'. The Integrated Training Centre (ITC) in Hnahthial in Lunglei District was established in 1981 to impart basic agricultural training. In addition to the abovementioned training institute, eight KVKs had been established in Mizoram. The Directorate of Research and Education is the nodal/host department. ICAR is the sponsoring authority as per the terms and conditions of the MOU. The production of seeds and demonstration of new farming systems are other areas of thrust taken up by the department.

Source : JICA Study Team

Photo 4.4.1 KVK in Champai District

(2) Department of Horticulture (DOH)

The DOH does not have research facilities. Therefore, it is dependent on the research works of ICAR and agricultural universities across the county for application in the farmers' fields. The department is operating a nurseries and the horticulture centre where quality planting materials are being produced. The department is also operating 28 circles within Mizoram wherein horticulture extension officers are posted and engaged in extension services.

(3) Soil and Water Conservation Department (SWCD)

The Mizoram state introduced rubber and coffee recently as the new industrial crop of which the SWCD is responsible. Scientific researches on agroclimatic suitability, evolution of suitable clones, pest and disease management, and harvesting and post-harvesting technology are undertaken by expert teams of the respective Rubber and Coffee Boards.

The SWCD has deployed eight district officers and 35 soil conservation rangers across the state. Presently there are 38 officers and 186 supporting field staff at various levels who work as extension personnel. In addition, officials both from the Rubber and Coffee Boards also assist them in extension services in the form of workshops, on-site training, tours to plantation areas outside the state, etc. Pamphlets and various media are also utilised for extension services.

4.4.3 Producers and Farmers' Organisations

Many farmers and producers' organisations are found in Mizoram. These organisations could be mainly categorised into: i) cooperative societies which are registered under the Mizoram Cooperative Societies Act 2006; ii) associations or societies which are registered under the Mizoram Societies Act 2005; and iii) self-help groups (SHGs) which are not registered.

(1) Cooperative Societies

Objectives of cooperatives are to promote and serve the social, economic and overall interests of their members or the public through self-help and mutual aid. In case of primary cooperative societies, a group with not less than 20 members from different families undertaking production, distribution or service-oriented activities could apply for registration as a cooperative. For application, a list of members with their signatures, proposed by-laws, and registration fee of Rs.500 should be submitted. Within 60 days from the date of receipt of application, the Registrar of the Cooperative Department shall scrutinise whether it complies with relevant provisions of the Mizoram Cooperative Societies Acts and Rules. If the Registrar is satisfied, the application shall be deemed to be accepted. A member of a cooperative society has to purchase a share and to carry out the duties as provided in its by-laws.

Table 4.4.3 shows the growth of Cooperative Societies in Mizoram for the last decade. As of 2010/11, there were 1,480 primary cooperative societies and ten state-level cooperative societies. Out of these , 756 cooperatives were related to agriculture fields such as dairy/livestock, piggery, fishery, farming, poultry, sericulture and floriculture (see Table 4.4.4).

Table 4.4.3 Growth of Cooperative Societies in Mizoram

No.	Year	No. of Societies	Membership (Nos.)	Share Capital (Rs. in millions)	Working Capital (Rs. in millions)
1	2000 - 01	1,502	47,271	46.41	157.72
2	2001 - 02	1,434	45,001	41.06	151.26
3	2002 - 03	1,511	44,130	67.36	341.63
4	2003 - 04	1,419	42,813	49.18	170.44
5	2004 - 05	1,372	42,801	30.67	293.66
6	2005 - 06	1,354	46,453	31.68	341.03
7	2006 - 07	1,367	42,286	18.08	301.53
8	2007 - 08	1,367	43,986	50.70	300.45
9	2008 - 09	1,361	43,920	451.78	814.47
10	2009 - 10	1,453	51,736	475.07	318.66
11	2010 - 11	1,480	44,111	220.14	1,635.77

Source: Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).

Table 4.4.4 Type-wise Cooperative Societies (Number and Membership)

Year		2000 - 01		2005 - 06		2009 - 10		2010-11	
#	Category	No.	Membership	No.	Membership	No.	Membership	No.	Membership
1	Industrial	132	2,014	104	1,832	89	1,494	83	1,420
2	Multi-Purpose	193	6,228	179	6,212	172	6,363	163	5,419
3	Dairy, Livestock and Multi Commodity	122	2,390	113	2,418	123	2,881	117	2,781
4	Piggery	194	4,257	175	5,636	227	5,896	235	4,141
5	Handloom and Weaving	157	4,895	156	3,974	177	4,303	198	4,327
6	Consumer	141	5,651	126	5,596	121	6,686	159	5,218
7	Service	86	3,208	59	2,137	54	2,248	67	2,139
8	Fishery	77	1,751	64	1,418	65	1,552	59	1,488
9	Farming including Fruit and Vegetable	271	12,797	258	13,317	305	15,650	278	12,755

Year		2000 - 01		2005 - 06		2009 - 10		2010-11	
#	Category	No.	Membership	No.	Membership	No.	Membership	No.	Membership
	Grower								
10	Poultry Farming	26	515	17	381	19	419	27	407
11	Canteen	15	406	13	433	12	450	13	428
12	Labour	11	244	10	240	8	431	11	486
13	Sericulture	26	768	35	941	37	1,144	37	1,064
14	Housing	17	545	10	234	8	182	7	164
15	Marketing	4	285	10	320	6	400	8	414
16	Floriculture	2	52	5	173	7	194	3	152
17	Meat Processing and Butcher	10	270	8	166	12	280	6	244
18	Lamps	12	1,217	12	1,025	11	1,163	9	1,064
TOTAL		**1,496**	**47,493**	**1,354**	**46,453**	**1,453**	**51,736**	**1,480**	**44,111**

Source: Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).

Officials of the Cooperation Department commented that cooperative societies could have access to more assistance from the government and other related agencies compared with other organisations registered under the Societies Act, although being registered and kept as a cooperative society is harder than the latter organisations. These possible assistances are: i) governments' subscription of share capital; ii) provision of loans; and iii) providing financial assistance (subsidies and grants). Share capital of cooperatives of quite high ratio is paid for by the government. Cooperatives could obtain loans from NCDC (National Cooperative Development Corporation), Mizoram Cooperative Apex Bank Ltd (MCAB), etc. In 2013-14, Rs.34 million are allocated from the Cooperation Department to mainly state-level cooperatives (81%), and to District Level and Primary Cooperative Societies, which were selected by the screening committee. Trainings and imparting cooperative education are taken up by the Mizoram State Cooperative Union (MSCU).

Despite these assistances, large numbers of cooperatives are not functioning and not viable. All cooperatives are subject to an annual audit by audit officers of the Cooperation Department. Audit officers conduct audit classification and check the performance of cooperatives. According to the results of these audits, quite many cooperatives were in "no business activities" or "not functioning" and classified into not good grades (mostly "C" or "D")[1]. Factors causing such situations of cooperatives are regarded as follows[2]:

- It is difficult for cooperatives to ensure active membership and build their awareness.
- Their governance is not adequate due to their insufficient management ability.
- Their efforts for capital formation are insufficient.
- Staff of Cooperation Department are not able to carry out all necessary works.
- State government has not emphasised strengthening cooperatives. Accordingly, allocation of funds from state government and programmes for this purpose are limited. Utilisation of cooperatives in state government programmes by other departments is insufficient.

(2) Associations

Any group of seven or more individuals associated for any objective (e.g., literature, arts, science, sports, any charitable purpose, other kinds which may be notified by the state government as being beneficial to the public), may subscribe their names to a Memorandum of Association and file them along with a copy of the regulation with the Registrar for registration under the Mizoram Societies Act. The memorandum shall contain the: a) name of the association, b) address, c) objective, and d) names of members of the governing body. After the Registrar is satisfied that the memorandum and the

[1] Annual Administrative Reports and Statistical Data of Cooperative Department in Mizoram (2008-2009, 2009-2010, and 2010-11)

[2] Based on comments from officials of the Cooperative Department

regulations comply with the requirement of the Act and rules, the association is registered as a society under this Act.

Unlike cooperative societies, general information on the associations registered under this Act (e.g. numbers by category) was not obtained. Some farmers' associations or organisations which the JICA Study Team visited and interviewed (e.g., All Mizoram Farmer's Union, Champhai Grape Growers Society, Zo Anthurium Growers' Society, Mizoram Iskut Growers' Association, Daklazau Association, Sihpuizau Association) were those registered under this Act. It was learned from these associations that they received assistance from the government (grant, subsidies, loans, etc.) which they were not able to receive as individuals.

(3) SHGs

Swarnajayanti Gram Swarozgar Yojana (SGSY) has been implemented as a CSS to provide sustained income to the rural poor to enable them to cross the poverty line. To achieve this objective, the scheme has its focus on community mobilisation by forming SHGs, capacity building, infrastructure facilities, subsidised credit linkage and market support. For the last ten years, 2,906 SHGs have been formed, 2,742 of which received financial assistance for their economic activities.

Table 4.4.5 SHGs Formed and Assisted under SGSY

No.	Year/ District	No. of SHGs Formed	No. of SHGs Assisted for Economic Activities	Total Expenditure (Rs. in millions)
1	2001 - 02	379	230	10.18
2	2002 - 03	294	156	8.40
3	2003 - 04	216	128	13.80
4	2004 - 05	290	153	18.36
5	2005 - 06	255	192	20.08
6	2006 - 07	146	102	13.96
7	2007 - 08	229	251	26.85
8	2008 - 09	274	850	35.25
9	2009 - 10	356	259	49.32
10	2010 - 11	467	421	49.32
District-wise (2010-11)				
1	Mamit	189	46	4.94
2	Kolasib	15	22	2.83
3	Aizawl	98	102	11.21
4	Champhai	25	107	8.40
5	Serchhip	30	30	2.95
6	Lunglei	15	29	8.82
7	Lawngtlai	70	27	6.89
8	Saiha	25	58	3.29
	Total:	**467**	**421**	**49.32**

Source: Statistical Abstract of Mizoram (2011).

Considering the shortcomings of the SGSY[3], it was restructured as the new CSS scheme of the **National Rural Livelihood Mission (NRLM)**, which started with two blocks each for Kolasib and Serchhip in 2013-14. Although both have similar objectives to reduce poverty by enabling the poor households to have access to gainful self-employment opportunities and by improving their livelihood through building strong grassroots institutions for the poor, there are major differences between them as shown below:

- NRLM has dedicated support structures at national (National Mission Management Unit: NMMU), state (State Mission Management Unit: SMMU), district (District Mission Management Unit: DMMU), and block (Block Mission Management Unit: BMMU) levels, which are autonomous from the Rural Development Department. The Secretary of RDD is a Director of SMMU, and some officials are designated exclusively to positions in SMMU and DMMU. It recruits five professional field staff and three administrative staff for each BMMU on contractual basis, which are responsible for assisting the SHGs' formation and their economic activities. There were no such autonomous structures for implementing SGSY.
- In addition to assisting the SHGs' formation and their economic activities which are conducted under SGSY, NRLM also promotes forming SHGs' federations: Primary Level Federation covering a village, Village Federation covering two to three villages and Cluster Federation covering five to six villages.

[3] According to the officer of RDD, SGSY was not functioning well because dedicated technical persons were not assigned for implementing SGSY.

- Under SGSY, capital subsidies were provided to SHGs (Rs.15,000 per SHG) for revolving loans among members for their immediate consumption needs and economic activities. In addition to this, NRLM provides other subsidies: i) on interest rate above 7.0% per annum for all eligible SHGs who have availed loans from mainstream financial institutions; and ii) to federations as Community Investment Fund (CIF) which would be provided to SHGs as loans for economic activities (Rs.50,000 per SHG).

The NRLM has just started and monitoring/evaluation of its performance has not yet been done. However, according to the officials in charge of RDD, some progress have been done so far: e.g., 525 SHGs in the four target blocks are ready to start functioning (mainly revived from the existing ones); around 40 primary level federations have been formed; training for newly recruited professional field staff of BMMU are underway; a Community Operational Manual has been drafted; and partnership with MRRB on providing loans for SHGs has been concluded.

The **Integrated Watershed Management Project (IWMP)** as a CSS has been implemented since 2009/10 with the objective of restoring ecological balance by harnessing, conserving and developing natural resources while providing sustainable livelihood options to people residing in watershed areas. Although IWMP includes a component for forming and assisting SHGs, the budget for this component is very limited (accounting for less than 10% of the total IWMP). Under this component, an SHG is formed with five to ten women who are BPL, do not hold lands, and have common interests. Once their action plan on economic activities is approved, a grant of Rs.25,000 is provided to their group as seed money, which would be used for revolving loans among their members. So far, 220 SHGs have been formed under this scheme. However, the RDD officials in charge estimate that SHGs, which have revolving funds among their members for economic activities, would only make up around 20% of the total. Regarding organisational structures for IWMP, project implementation agencies (PIA) consisting of Block Development Officers, relevant line departments, VCs, and voluntary organisations (VOs) have been established at the RD block level and each PIA employs four watershed development team (WDT) members. In addition, watershed committees (WC) have been established at the village level. PIAs, together with WCs, have been in charge of enlightening and training SHG members and monitoring their activities. However, it seems that activities of SHGs and their members have not been fully followed by IWMP due to limited budget and personnel, which have caused poor performances of SHGs.

World Vision India (WVI) has promoted SHGs in three districts of Saiha, Lawngtlai and Lunglei in collaboration with State Bank of India and Mizoram Rural Bank (MRB) through the formation of SHGs and providing guidance and training. So far, WVI has assisted in forming 900 SHGs (100 in Saiha, 600 in Lawngtlai, and 200 in Lunglei), 410 (40, 300, and 70 respectively in the same districts) of which have been linked to the bank for credit and involved with some livelihood activities. While good effects by promoting SHGs are observed, (e.g., many SHG members are able to adopt sustainable livelihood for their families) some constraints are pointed out by the project manager that awareness of the rural communities on SHGs are still low and constant monitoring of SHG activities is lacking.

Table 4.4.6 Participation in Cooperative Societies and Groups

No.	Category	No. of Households	% of Total Sample Households (360)
1	Agriculture/Farming	78	21.67
2	Horticulture	45	12.50
3	Livestock/Dairy	2	0.56
4	Sericulture	9	2.50
5	Fishery	11	3.06
6	Sales/Marketing	0	0.00
7	Savings/Credit	0	0.00
8	Self-Help Group	5	1.39
9	Others	0	0.00
	Total	136*	37.78

Note: Out of 136 households, 14 households participate in 2 cooperative societies and groups.
Source: Household Survey (December 2013 – January 2014) by the JICA Study Team.

(4) Results of Rural Household Survey

The JICA Study Team conducted a household survey covering 360 sample households in 24 villages of 8 districts. Table 4.4.6 shows the households' participation in cooperative societies and groups. More than 20% of the total respondent households participate in agriculture/farming cooperative societies, followed by horticulture (12.5%), and fishery (3.1%) cooperative societies. Regarding benefits gained as members of cooperative societies and groups, 66 respondents answered "received technical guidance and training", 41 for "obtained

information", 25 for "cooperative shipping/sale", eight for "obtained cash grant", and five for "obtained subsidy". From the survey, 147 respondents are satisfied (12 highly satisfied, and 135 to a certain extent) as members of cooperative societies and groups.

(5) Constraints and Problems

The following constraints and problems regarding farmers' groups were identified:

- Many cooperatives, associations and SHGs have been formed under several government schemes and guidance from related government departments, and received government assistance such as subsidies, loans and trainings. However, those who have continued economic activities based on government assistance are limited.
- It is difficult for such organisations to ensure active membership and build awareness.
- Majority of organisations and their members are lacking in capacities (skill and knowledge) necessary for continuing economic activities.
- The follow-up system including monitoring for continuing economic activities of these organisations has not been established. Knowledge and skill inputs from government are insufficient in terms of quality and quantity, and not provided systematically without coordination among related government departments and institutes.
- NGOs which could enhance awareness of organisation members and support their economic activities are limited.

4.4.4 Agriculture Credit and Rural Finance

(1) Institutional Finance

Table 4.4.7 shows the network and outreaches of banking in Mizoram. There are sufficient number of banks in Mizoram: 19 commercial banks (52 branches) including the State Bank of India (29 branches), Mizoram Rural Bank (65 branches), and Cooperative Apex Bank (12 branches). The number of persons served per branch in Mizoram is around 8,500 (2011 census), which is much better than the national average (around 15,000). However, the locations of their headquarters and branches are concentrated in Aizawl and other urban centres.

Table 4.4.7 Bank Network and Outreaches

Agency	As of 30/06/2012		As of 31/03/2011					
	No. of Banks	No. of Branches	No. of Banks	No. of Branches			Per Branch Outreach	
				Total	Rural	Urban	Villages	Households
Commercial Banks	19	52	12	42	22	20	20	6,075
Mizoram Rural Bank (MRB)	1	65	1	62	52	10	14	4,083
Coop. Apex Bank (MCAB)	1	712	1	12	7	5	74	22,645
Total	21	129	14	116	81	35	7	2,204

Source: Figures of 2012 are from Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).
Figures of 2011 are from State Focus Paper 2012-13 Mizoram State, NABARD, Mizoram Regional Office, Aizawl.

Table 4.4.8 shows loan amounts in Mizoram by broad sector. Shares of loan for agriculture sector are not high: they account for only 30% in 2009/10 and 21% in 2010/11.

Table 4.4.8 Loan Amount by Broad Sector

Broad Sector	2009-10			2010-11		
	Target (Rs in millions)	Achievement (Rs. in millions)	Achievement (%)	Target (Rs. in millions)	Achievement (Rs in millions)	Achievement (%)
Crop Loan	46	227	493.5	140	188	134.3
Term Loan (Agriculture)	428	490	114.5	512	272	53.1
Total Agriculture Credit	**474**	**718**	**151.5**	**652**	**460**	**70.6**
Non-Farm Sector	365	217	59.5	465	222	47.7
Other Priority Sector	1,388	1,536	110.7	1,949	1,509	77.4
Total Priority Sector	2,286	2,434	106.5	3,067	2,192	71.5

Source: State Focus Paper 2012-13 Mizoram State, NABARD, Mizoram Regional Office, Aizawl.

The National Bank for Agriculture and Rural Development (NABARD) functions as provider and regulator of credit and other facilities for promoting agriculture and rural development-related fields through credit planning and monitoring, refinancing to rural financial institutions, providing loans to state governments for developing rural infrastructure and strengthening the cooperative credit structure, and so forth.

NABARD Mizoram Regional Office has implemented such schemes/programmes as: i) credit linked subsidy scheme, ii) government-sponsored programme, iii) promotional and development programme, etc., by providing loans and grants to end users not directly but through intermediary banks (commercial banks, MRB, and MCAB). Table 4.4.9 shows the amount of loans and grants provided by NABARD to commercial banks, MRB, and MCAB for the last three years.

Table 4.4.9 Loans and Grants Provided by NABARD

	2010/11	2011/12	2012/13
Loans	**(Rs. lakh)**		
Commercial Banks	-	-	282.00
MRB	80.00	100.00	110.00
MCAB	-	-	-
Total	**80.00**	**100.00**	**392.00**
Grants			
Commercial Banks	3.73	-	-
MRB	20.48	88.58	31.43
MCAB	-	-	-
Total	**24.21**	**88.58**	**31.43**

Note: Loans and grants were provided to MCAB prior to 2010/11; thus, MCAB still has outstanding loan from NABARD despite no loans and grants for the last three years.
Source: NABARD, Mizoram Regional Office.

As another scheme for farmers, Kisan Credit Card (KCC) was introduced to mitigate the difficulties faced by farmers in accessing timely and hassle-free credit for meeting their production needs. The KCC scheme covers all categories of farmers including oral lessees, tenant farmers, and share croppers. By the end of March 2013, a total of 36,884 KCCs have been issued by commercial banks, MRB and MCAB.

Table 4.4.10 Number of Kisan Credit Card (KCC) issued in Mizoram by March 2013

Agency	No. of KCCs Issued
Commercial Banks	11,129
Mizoram Rural Bank (MRB)	23,178
Mizoram Cooperative Apex Bank (MCAB)	2,577
Total	36,884

Source: NABARD, Mizoram Regional Office.

(2) Support for SHGs, Cooperatives and NGOs

Loans are provided by intermediary banks not only to individuals but also to SHGs and cooperative societies. By the end of March 2013, Rs. 2,092 lakh of loans have been provided to 2,746 SHGs through intermediary banks. Table 4.4.11 shows the lending activities of MRB and MCAB. While majority of borrowers are individuals, there are some lending for cooperative societies by MCAB[4].

For the purpose of promoting SHG linkage, NABARD has provided grants to NGOs who have assisted in formulating SHGs and their activities. Twenty NGOs received grants of Rs.115.35 lakh from NABARD in 2010/11, 14 NGOs received Rs.83.33 lakh in 2011/12, and 14 NGOs received Rs.49.15 lakh in 2012/13.

Table 4.4.11 Agency-wise SHG Linkage (as of the end of March 2013)

	Agency	No. of SHGs Savings Linked	No. of SHGs Credit Linked	Amount of Loan Disbursed (Rs. lakh)
1.	Commercial Banks	205	148	221.97
2.	Regional Rural Bank (MRB)	1,336	2,568	1,808.49
3.	Cooperative Bank (MCAB)	653	30	61.04
	Total	**2,194**	**2,746**	**2,091.50**

Source: NABARD, Mizoram Regional Office.

[4] MCRB holds shares of 1,037 Cooperative Societies.

Table 4.4.12 Lending Activities of MRB and MCAB

			MRB									MCAB
			Aizawl	Champhai	Mamit	Kolasib	Sercchip	Lunglei	Saiha	Lawngtlai	Total	Total
2010/11	Client	SHGs	787	76	23	44	74	97	32	42	1,175	15
		Individuals	9,697	1,853	642	2,208	1,347	4,225	343	1,640	21,955	2,158
		Cooperatives	0	0	0	0	0	0	0	0	0	0
		Total	10,484	1,929	665	2,252	1,421	4,322	375	1,682	23,130	2,173
	Amount (Rs. crores)		79.70	14.47	2.95	7.07	7.88	19.71	12.98	15.15	159.91	94.30
	Balance (INR crores)		143.47	16.53	8.14	20.85	17.40	47.82	13.93	25.74	293.88	189.56
2011/12	Client	SHGs	368	187	132	81	57	350	42	90	1,307	10
		Individuals	10,797	1,925	894	2,653	2,906	5,447	900	1,881	27,403	2,061
		Cooperatives	0	0	0	0	0	0	0	0	0	8
		Total	11,165	2,112	1,026	2,734	2,963	5,797	942	1,971	28,710	2,079
	Amount (Rs. crores)		57.47	13.43	5.70	7.27	14.01	21.34	20.90	18.62	158.74	96.64
	Balance (Rs. crores)		186.94	24.43	11.36	24.14	24.73	59.12	30.56	41.60	402.88	237.06
2011/12	Client	SHGs	368	187	132	81	57	350	42	90	1,307	4
		Individuals	13,096	2,231	921	2,680	2,445	9,168	1,172	1,881	33,594	1,966
		Cooperatives	0	0	0	0	0	0	0	0	0	4
		Total	13,464	2,418	1,053	2,761	2,502	9,518	1,214	1,971	34,901	1,974
	Amount (Rs crores)		90.28	21.17	108.91	12.11	10.79	19.22	9.86	29.74	302.08	102.24
	Balance (Rs. crores)		233.92	36.40	34.18	32.35	17.18	73.91	37.91	64.45	530.30	290.10

Source: Mizoram Rural Development Bank, and Mizoram Cooperative Apex Bank Ltd.

(3) Constraints and Problems

The following constraints and problems regarding agricultural and rural finances were identified:

- Since headquarters and branches of banks are concentrated in Aizawl and other urban centres, farmers' access to financial institutions including banks are limited. According to the result of the rural household survey previously mentioned, only three out of 360 respondent households obtained loans from banks, four from cooperatives, and two from SHGs for the last three years.
- There seems to be many cases where borrowers have used loans for activities other than their intended purposes such as for investing in their economic activities mainly due to their lack of understanding on banking system. Even if borrowers use loans for its intended purposes such as agriculture production activities, there are also many cases where they could not obtain profits due to several reasons (difficulties in obtaining inputs, insufficient agriculture production facilities, insufficient agriculture skills, difficult access to markets, etc.), and accordingly, could not repay their debts.
- Although banks have held awareness campaigns to make farmers understand the banking system and procedures, their coverage is limited. Follow-ups by bank staff on how farmer borrowers should properly utilise loans for their economic activities are not sufficient.
- Bank staff are not the ones who could provide technical and knowledge inputs for agriculture production activities. Related government departments and NGOs are the ones who could provide such inputs to farmers. However, banks rarely work together with these relevant departments[5]. NGOs that can provide high-quality technical and knowledge inputs to farmers are very limited.
- As a result, rates of overdue debts and NPL have become high. The ratio of the number of loan clients holding overdue debts and those holding NPL against the number of loan clients in 2012/13 are 22% and 6.4% for MRB, and 46% and 18.7% for MCAB, respectively. Rates of NPL are high especially in the agricultural sector and in loans to individual clients.

[5] In the process of implementing NRLM and IWMP, RDD has linkage with NABARD and intermediary banks.

Table 4.4.13 Non-performing Loans (NPL) Status of MRB and MCAB

	MRB			MCAB		
	2010-11	**2011-12**	**2012-13**	**2010-11**	**2011-12**	**2012-13**
No. of loan clients	31,880	37,769	42,941	10,060	9,870	10,406
No. of loan clients who hold overdue debts	4,283	9,512	9,617	3,851	4,972	4,821
No. of loan clients who hold NPL	3,406	3,245	2,731	1,739	1,903	1,945
Outstanding balance (Rs. in millions)	293.89	402.89	549.84	1,895.58	2,370.55	2,900.98
Overdue outstanding balance (Rs. in millions)	13.18	74.29	74.38	240.58	380.73	249.70
Outstanding balance of NPL (Rs. in millions)	27.27	38.88	41.79	242.79	230.25	302.54

Source: Mizoram Rural Development Bank, and Mizoram Cooperative Apex Bank Ltd.

4.5 Agro-processing

This section will discuss the present condition of the agro-processing industry in Mizoram State including post-harvest processing done in the production area.

4.5.1 Policy, Regulation, and Plan

(1) National Level

The **National Twelfth Five-Year Plan (2012–2017)** provides the objectives and strategy for promotion of the micro, small, and medium enterprises (MSMEs) in the industry sector especially for the food processing industry as follows:

(a) Objectives

- To develop the food processing sector to enable containment of food inflation and food wastage.
- To create one million additional jobs during the 12th plan period.

(b) Strategy and Key Recommendations

- The strategy for the 12th Plan has been devised based on three basic principles. Firstly, greater emphasis would be laid on the decentralised process of implementation with greater involvement of the states in the selection of projects vis-a-vis beneficiaries and monitoring their implementation.
- Secondly, instead of project implementation, focus would be on policy-making and coordination in order to address critical issues impacting the value chain in the sector.
- Lastly, the existing focus on infrastructure development will be continued with expansion of scope and depth to ensure sustainability of the value chains.
- Adoption of a decentralised approach to instil greater involvement of the states and appropriate coordination between states and stakeholders is a well-conceived idea for development of the food processing sector. Launching a National Mission on Food Processing (NMFP) will be an appropriate vehicle to carry forward the idea of decentralisation.

Description regarding post-harvest processing field is very limited in the National Twelfth Five-Year Plan (2012–2017) and described together with market facilities and agro-processing as follows:

- Post-harvest losses, probably averaging about 10% to 25%, are particularly high in horticulture, livestock, and fisheries. Very large investments are required in developing agricultural markets, grading and standardisation, quality certification, warehouses, cold storages, and other post-harvest management of produce in order to address this problem.
- Such large investments are possible only with the participation of the private sector which, in turn, require freedom from controls on sales/purchase of agricultural produce, its movement, storage, and processing.

(2) State Level

The Industry Department (ID) of Mizoram State, through the Mizoram Industrial Policy, 2012, points out the strategy of the industrial sector as follows:

a) Vision

- Sustainable industrial growth especially in the MSME sector in Mizoram,
- Encourage increasing value addition in various local produce and giving better income more directly to farmers,
- Conducive environment for investment, and
- Promote direct and indirect employment opportunities.

b) Mission

The mission is to accelerate industrial development in Mizoram by maximising investment, output, growth, employment, and competitiveness through development of infrastructure, human resource, incentives, and administrative support network.

c) Objectives and Challenges

The objectives and challenges are listed in Table 4.5.1

Table 4.5.1 Objectives and Challenges

	Objectives	Challenges
1	To create infrastructure facilities, provide incentives and marketing as well as technical support to industries	Creation of infrastructure in a speedy and fast track mode in order to create a conducive climate for investment. The potential thrust for infrastructure development can be summarised as follows: 1) Administrative infrastructure, 2) Industrial infrastructure in the form of construction of industrial estate, park, centre, etc., 3) Marketing infrastructure, and 4) Infrastructure for resource management and quality improvement. Providing incentives to the SME sector. Market promotion and competitiveness.
2	To create employment opportunities particularly for the vulnerable sections of society and people living in rural areas, ensuring inclusive development	Employment generation.
3	To provide skills development and training for educated youth in order to develop entrepreneurial skills and make them self-employed	Skills development and employability enhancement.
4	To attract investments to the state	Investment promotion. The poor infrastructure condition of the state as a whole is not attractive to investors outside the state. The potential investors in the state are facing capital scarcity. More efforts are still needed to attract investment and make use of the central policy and state policy.
5	To reduce procedural formalities to speed up industrialisation	Creation of a reliable and updated data. Administrative restructuring and strengthening.
6	To reduce sartorial and regional imbalance in the industrial development of the state by promoting industries under all sectors	Revitalisation and privatisation of public small enterprise (PSE).
7	To create proper linkage of processing industries with the farm produce of agriculture, horticulture, forest, and livestock	Thrust may be given to the following potential sectors utilising locally available raw materials: 1) Food processing, 2) Textile and garments, 3) Handloom, 4) Handicraft, 5) Bamboo based industries, 6) Wood based industries, 7) Khadi and village industries.

Source : JICA Study Team

4.5.2 Current Situation of the Agro-processing Industry

(1) Overview of Post-harvest Processing

The post-harvest processing carried out by farmers are very outdated and generally conventional and seems to have low motivation for improvement among farmers.

(a) Rice

For the post-harvest processing of paddy, manual handling remains extremely dominant. Stepwise practices are summarised in Table 4.5.2.

Table 4.5.2 Post-harvest Processing Practice for Paddy by Stage

Stage	Practice	Note
Harvesting	Cutting with a sickle Cutting position differs from root to near head of a straw due to convenience to the following process	Straw after threshing is used for animal feed.
Threshing	Straws with paddy are put on the ground and run over by cows or a tractor is a major method.	Tractor use is very limited. A small number of mechanical

	Manual beating to a wooden pole exists.	threshers are used. Number of tractors and threshers used in the state is unknown and does not have a record.
Drying	Sun drying on a vinyl seat.	
Storage	Stacking vinyl or gunny bags on the living floor or on some insulation materials such as galvanized tin plate and wooden plate on the ground inside a house. Storage in a wooden box and a bamboo basket is not common.	
Milling	There are villagers who have milling machines that render milling services to rice producers. Service fee is about Rs. 10–20 per "tin" of paddy. Some millers receive by-product, bran, instead of cash as payment. The recovery rate of milled rice volume to paddy is observed and estimated at around 50%.	Milling machines are conventional "Engerberg" type and made in India. Spare parts such as screens, friction rolls, and bearings are purchased in Aizawl. "Tin" is a tin box of 16 li containing 7.5–8 kg of paddy. No one could not answer milling recovery rate. No statistical data on the number and location of millers and machines.
Grinding	Some villagers provide grinding services to other villagers through a machine. The machine is used for making powder from rice, corn, turmeric, etc. Simple noodle making machines are also seen.	Myanmar-made machines seemed popular.

Source: JICA Study Team

Paddy Harvesting

Rice Huller (Husker) Machine

Grinder

Source : JICA Study Team

Photo 4.5.1 Post-harvest Processing Practice for Paddy

(b) Horticulture and miscellaneous crops

Results of the observation and interview with persons concerned by the JICA Study Team regarding post-harvest processing practices of other produce are as follows:

Table 4.5.3 Post-harvest Processing Practice by Produce

Produce	Practice	Note
Coffee	Skin of coffee beans (cherries) is removed using a pulping machine and beans are dried under the sun.	Manual pulping machine is common and few engine-driven machines are used.
Rubber	Latex (sap) is collected by tapping. Gathered latex is dehydrated using a pressing machine (plain roller), forming a sheet using a roller (grove roller), and dried in a chamber or under the sun.	A drying chamber can shorten the drying time and get better quality latex sheeting.
Palm Oil	Fruits are sold to the processing companies without any post-harvest processing.	Three processing companies are engaged in palm oil production, namely, Godrej Agrovet Ltd., Food Fats and Fertilizer Ltd., and Ruch Saya Industries Ltd.
Broom	Ears are sold in green colour after harvesting or in brown	Producers in Kolasib District can sell their products to collectors coming

Produce	Practice	Note
	colour when dried under the sun after harvesting.	from Assam without difficulties.
Beans	Manual handling.	
Vegetables and fruits	No special processing practice after harvesting was observed for vegetables and fruits. Some vegetables, mainly leafy vegetables, are washed and tied up by a sales unit.	

Source: JICA Study Team

Coffee Huller and Peeler Machine

Manual Coffee Huller Machine

Plain Rubber Roller

Source : JICA Study Team

Photo 4.5.2 Post-harvest Processing Machines for Coffee and Rubber

(c) Results of the farm household survey

All the information presented are based on the data obtained from the farm household survey of rural households. These households were randomly sampled from 24 purposively selected villages from different parts of the state. About 15 sample households were covered in each selected village and a total of 360 rural households were covered in this survey.

1) Post-harvest treatment

More than 80% of respondents have no special treatment on post-harvest processing. According to the result in Table 4.5.4 below, it seems that respondents do not know the process of threshing and drying of paddy even though they actually carry out such activities. The questionnaire items were understood well by the respondents. However, they think that they do not need to take special care about post-harvest processing of their products.

Table 4.5.4 Post-harvest Treatment of Farmers

Sl. No	Cultivation Type	No. of Respondents	Post-Harvest Treatment (% of Cases Reported)				
			No Processing	Threshing	Drying	No Response	Total
1	Shifting Cultivation	970	92.8	0.1	0.2	6.8	100
2	Settled Rainfed Cultivation	110	43.9	0	7.9	48.2	100
3	Settled Irrigated Cultivation	7	100	0	0	0	100
4	Fruits and Industrial Crops	205	51	0	0	49	100
	Total	1,292	81.1	0.1	0.8	18	100

Source: Household Survey, December 2013 - January 2014, JICA Study Team

In this regard, mechanisation has not been started well. The survey result showed a limited number of land preparation machines such as tractors and power tillers and maybe threshers are used only in the settled and irrigated cultivation areas.

2) Storage arrangement

Major arrangements of product storage for the respondents are in bulk (30.8%) and bag (44.0%). Seven farmers in the settled and irrigated cultivation type store their paddy products in wooden boxes.

Table 4.5.5 Storage Arrangement of Farmers

No.	Cultivation Type	No. of Respondents	Storage Arrangements (% of Cases Reported)						
			Bulk	Bag	Wooden Box	Bamboo Basket	Others	No Response	Total
1	Shifting Cultivation	970	30.7	53.1	3.4	0.5	10.9	1.3	100
2	Settled Rainfed Cultivation	110	38.3	18.3	2.6	0	5.2	35.7	100
3	Settled Irrigated Cultivation	7	0	0	100.0	0	0	0	100
4	Fruits and Industrial Crops	205	28.4	16.7	0	4.4	20.6	29.9	100
	Total	1,292	30.8	44.0	3.3	1.1	11.9	8.9	100

Source: Household Survey, December 2013 - January 2014, JICA Study Team

The average number of days of storage of products based on the answers of farmers were compiled in Table 4.5.6. The longest average storage period is 122 days for paddy followed by 117 days for ginger, 66 days for chilli, 56 days for colocasia, and 46 days for pumpkin.

Table 4.5.6 Average Storage Period by Product

Sl. No.	Crop Name	No. of Cases Reported	Average No. of Days	Sl. No.	Crop Name	No. of Cases Reported	Average No. of Days
Shifting Cultivation				**Settled Rainfed Cultivation**			
1	Paddy	191	121.79	1	Oil Seed Crop	6	5
2	Maize	77	29.58	2	French Bean	2	3
3	Oil Seed Crop	30	24.07	3	Sugarcane	8	13.13
4	French Bean	2	1.5	4	Squash	2	9.5
5	Potato	10	4	5	Pumpkin	3	13.67
6	Colocasia	21	55.62	6	Brinjal	6	3.33
7	Pumpkin	79	45.87	7	Mustard Leaf	14	1.21
8	Brinjal	95	3.45	8	Chilli	10	0.3
9	Okura	2	3.5	9	Solanum (Samtawk)	7	1.14
10	Cucumber	33	5.18	10	Bean	3	2.67
11	Bitter Gourd	4	4.25	11	Ginger	3	116.67
12	Mustard Leaf	17	2.12	12	Arecanut	5	4
13	Cowpea Leaf	8	2.75	13	Coffee	9	20
14	Pumpkin Leaf	12	4.67	14	Broom	28	0.5
15	Chilli	143	66.41	**Settled Irrigated Cultivation**			
16	Sweet Potato	1	30	1	Paddy	7	290
17	Solanum (Samtawk)	100	3.34	**Fruits and Industrial Crops**			
18	White Pumpkin	62	47.47	1	Mango	6	8
19	Ginger	82	18.74	2	Orange	96	5.36
				3	Lemon	5	6.2
				4	Hatkora	11	7.55
				5	Banana	38	12.68
				6	Papaya	5	10
				7	Pineapple	28	9.04
				8	Grape	15	25.33
				9	Avocado	1	3

Source: Household Survey, December 2013 - January 2014, JICA Study Team

3) Post-harvest losses

Most of the farmers interviewed felt and estimated that the losses during post-harvest handling of their products is below 10% (87%). Approximately 1.3% of respondents estimated a loss generation of more than 20% of their products.

Table 4.5.7 Estimated Post-harvest Losses by Farmers

No. of Respondents	Estimated Post Harvest Loss (% of Cases Reported)					
	Below 5%	5-10%	10-20%	More than 20%	No Response	Total
1,292	49	37	4.1	1.3	8.6	100

Source: Household Survey, December 2013 - January 2014, JICA Study Team

Based on the details of estimation by product as responded by more than ten farmers, leafy vegetables together with colocasia, hatkola, and grapes show relatively high losses (See Table 4.5.7 and Table 4.5.8).

In this regard, there is no reliable assessment data carried out by the research authorities for post-harvest losses on agricultural products in the state.

Table 4.5.8 Post-harvest Loss Estimation by Product

Shifting Cultivation

Sl. No.	Crop Name	No. of Reports	Estimated Post Harvest Loss (% of Cases Reported)					
			Below 5%	5-10%	10-20%	More than 20%	No Response	Total
1	Paddy	191	59.2	35.6	2.6	**0.5**	2.1	100
2	Maize	77	31.2	54.5	11.7	0	2.6	100
3	Oil Seed Crop	30	43.3	56.7	0	0	0	100
4	French Bean	2	0	100.0	0	0	0	100
5	Potato	10	100.0	0	0	0	0	100
6	Colocasia	21	28.6	52.4	14.3	0	4.8	100
7	Pumpkin	79	44.3	53.2	1.3	0	1.3	100
8	Brinjal	95	52.6	45.3	1.1	0	1.1	100
9	Okura	2	100.0	0	0	0	0	100
10	Cucumber	33	66.7	30.3	3	0	0	100
11	Bitter Gourd	4	75.0	25.0	0	0	0	100
12	Capsicum	1	100.0	0	0	0	0	100
13	Mustard Leaf	17	52.9	29.4	0	**17.6**	0	100
14	Cowpea Leaf	8	37.5	62.5	0	0	0	100
15	Pumpkin Leaf	12	33.3	66.7	0	0	0	100
16	Chilli	143	42.0	49.0	7.7	0	1.4	100
17	Sweet Potato	1	100.0	0	0	0	0	100
18	Solanum (Samtawk)	100	55.0	44.0	0	0	1.0	100
19	White Pumpkin	62	40.3	54.8	3.2	0	1.6	100
20	Ginger	82	70.7	23.2	4.9	0	1.2	100

Settled Rainfed Cultivation

Sl. No.	Crop Name	No. of Reports	Estimated Post Harvest Loss (% of Cases Reported)					
			Below 5%	5-10%	10-20%	More than 20%	No Response	Total
1	Oil Seed Crop	6	0	16.7	0	0	83.3	100
2	French Bean	2	100.0	0	0	0	0	100
3	Sugarcane	8	62.5	25	0	0	12.5	100
4	Squash	2	0	100.0	0	0	0	100
5	Pumpkin	3	66.7	33.3	0	0	0	100
6	Brinjal	6	66.7	16.7	16.7	0	0	100
7	Carrot	1	100.0	0	0	0	0	100
8	Mustard Leaf	14	64.3	21.4	0	**14.3**	0	100
9	Pumpkin Leaf	1	100.0	0	0	0	0	100
10	Chilli	10	100.0	0	0	0	0	100
11	Sweet Potato	1	100.0	0	0	0	0	100
12	Solanum (Samtawk)	7	85.7	14.3	0	0	0	100
13	Bean	3	33.3	0	0	66.7	0	100
14	Ginger	3	0	100.0	0	0	0	100
15	Turmeric	6	0	0	0	0	100.0	100
16	Coffee	9	100.0	0	0	0	0	100
17	Broom	28	10.7	3.6	0	0	85.7	100

Settled Irrigated Cultivation and Fruits and Industrial Crops

Sl. No.	Crop Name	No. of Reports	Estimated Post Harvest Loss (% of Cases Reported)					
			Below 5%	5-10%	10-20%	More than 20%	No Response	Total
Settled Irrigated Cultivation								
1	Paddy	7	57.1	0	42.9	0	0	100
Fruits and Industrial Crops								
1	Mango	6	83.3	0	16.7	0	0	100
2	Orange	96	31.3	15.6	2.1	0	51.0	100
3	Lemon	5	80.0	20.0	0	0	0	100
4	Hatkora	11	36.4	0	0	**45.5**	18.2	100
5	Banana	38	71.1	15.8	2.6	**2.6**	7.9	100
6	Papaya	5	80.0	20.0	0	0	0	100
7	Pineapple	28	25.0	39.3	10.7	0	25.0	100
8	Grape	15	0	53.3	33.3	**13.3**	0	100
9	Avocado	1	0	0	0	100.0	0	100

Source: Household Survey December 2013 - January 2014, JICA Study Team

4) Major constraints of post-harvest management

Farmers consider that lack of labour is the biggest constraint to the proper post-harvest management of their products, more than technology (knowledge) and facilities (storages and processing machines). Luck of manpower, more than expected, is one of the serious constraints among farmers, not only for the post-harvest processing stage but also in the production stage.

Table 4.5.9 Major Constraints for Post-harvest Management

Sl. No.	Cultivation Type	No. of Respondents	Major Constratint (% of Cases Reported)					
			Lack of Labour	Lack of Skills and Knowledge	Lack of Storage Facilities	Lack of Processing Machines	No Response	Total
1	Shifting Cultivation	970	78.7	8.1	10	0.1	3.1	100
2	Settled Rainfed Cultivation	110	45.5	2.7	14.5	1.8	35.5	100
3	Settled Irrigated Cultivation	7	85.7	0	14.3	0	0	100
4	Fruits and Industrial Crops	205	48.3	13.7	6.3	0	31.7	100
	Total	**1292**	**71.1**	**8.5**	**9.8**	**0.2**	**10.4**	**100**

Source: Household Survey December 2013 - January 2014, JICA Study Team

(2) Overview of the Agro-processing Industry

ID is the responsible organisation for the development of the industry sector including agro-processing industries in the state.

Almost all enterprises in the state are small as cottage-based businesses, except for a few state-owned enterprises and categorised MSMEs. In this regard, an enterprise is defined and categorised in four groups by amount of capital as shown in Table 4.5.10;

Table 4.5.10 Category of Industrial Enterprises

Category	Micro	Small	Medium	Large
Amount of Capital	Below Rs.25 lakhs	Below Rs.500 lakhs	Below Rs.1,000 lakhs	More than Rs.1,000 lakhs

Source: Industry Department

According to the statistical data of ID, 124 enterprises under the "Food Processing" type industry, among the total 1,483 enterprises were registered since 2007, after the new MSME Development Act, 2006 was enacted. Additionally, the district-wise number of industries as of 31 March 2011, including registration before 2007, is shown in Table 4.5.11.

Table 4.5.11 District-wise Number of Industries as of 31 March 2011

No.	Type of Industry	Cumulative Number of Registered SSI /EM-II filed								Total
	District	Mamit	Kolasib	Aizawl	Champhai	Serchhip	Lunglei	Lawngtlai	Saiha	
1	Food Products	12	14	414	18	16	121	9	27	**631**
2	Tobacco Products	1	3	41			2			**47**
3	Wool, Silk, Synthetic Fibre Textile	3	8	288	6	7	3			**315**
4	Hosiery and Garments	16	23	224	12	7	143	13	71	**509**
5	Wood Products	16	5	686	13	16	202	13	42	**993**
6	Paper Products and Printing	2	2	314	5	1	61	2	18	**405**
7	Leather Products		2	22			2			**26**
8	Rubber and Plastic Products			70	2		38	2	7	**119**
9	Chemical and Chemical Products			7				1	1	**9**
10	Non-Metallic Mineral Products	5	7	110	10	4	34		4	**174**
11	Metal Products	11	24	979	35	36	100	17	55	**1257**
12	Machinery and Parts Except Electrical			1						**1**
13	Electrical Machinery and Apparatus						1			**1**
14	Miscellaneous Manufacturing Industries		30	907	7	4	17	3	11	**979**
15	Water Works and Supply			4						**4**
16	Construction		29	16		13	3		5	**66**
17	Activities Allied to Construction			4		1	4			**9**
18	Restaurants and Hotels			14		1				**15**
19	Education and Scientific and Research Service			15		13				**28**
20	Medical and Health Service			9	1		2	1	1	**14**
21	Personal Service	5	2	673	9			3	13	**705**
22	Repair Service	1	11	659	8	1	94	11	28	**813**
23	Service not elsewhere classified		1	5		6	36		9	**57**
24	Others				5	5	6	3	15	**34**
Total		**72**	**161**	**5462**	**131**	**131**	**869**	**78**	**307**	**7211**
No. of Employment		248	521	34959	549	471	2296	281	1118	40443

Source: ID

Additional data and information on the above food processing enterprises, concerning their present activities and business conditions, are not available in the department.

The duties of the central government are divided between the Ministry of MSME Industry and Ministry of Industry for Large-scale Enterprises. Subsequently, the duty of ID is for the registration of MSME only, and registration of large-scale enterprises is accepted at the office in Shilong, Meghalaya.

(a) Condition of selected enterprises

The following are the information on selected enterprises engaged in agro-processing business among all enterprises, which the JICA Study Team visited.

1) Mizoram Food and Allied Industries Corporation (MIFCO) Ltd.

MIFCO Ltd., established in 1989, is one of the state-owned enterprises (SOEs) under ID. The main objectives of MIFCO Ltd. are the following:

i) To engage in the processing and preservation of food, milk, fish, fruits, vegetables, and all food items of animal, poultry, agricultural, or pisciculture origin.
ii) To deal with processed food, plant/machinery, and implement accessories and pre-requisites of food processing.
iii) To render necessary assistance for the processing and preservation of agricultural produce, forest produce, and produce of animal origin for the purpose of increasing the quantity of availability or otherwise of subsidiary foods in all their forms and variations, either for export or for consumption in the country.

Source: JICA Study Team

Photo 4.5.3 Juice Concentration Plant, Chhingchhip

They operate three agro-processing factories, namely, Fruit Juice Concentrate Plant in Chhingchhip, Food Processing Plant in Sairang, and Pork and Poultry Processing Plant in Zemabawk. Their sales products in 2010-2011 are as follows:

Table 4.5.12 Sales Products of MIFCO Ltd.

Item	Quantity	Rate	Amount (in Rs. lakhs)
< Fruit Juice Concentrate Plant>	**(bottle)**	**(Rs./bottle)**	
Passion fruit squash	4,745	40	1.9
Orange squash	1.323	40	0.53
Pineapple squash	3,232	30	1.29
Passion fruit ready-to-serve (RTS) drinks	486	8	0.039
Total			**12.94**
< Food Processing Plant>	**(bottle)**	**(Rs./bottle)**	
Passion fruit squash	10,044	40	4.25
Orange squash	5,145	40	2.06
Pineapple squash	10,622	30	3.01
Passion fruit RTS	3,891	10	0.39
Total			**9.71**
< Pork and Poultry Processing Plant>	**(kg)**	**(Rs./kg)**	
Smoked pork	3.973	180	7.09
Sausage	59	450	0.27
Ham	52	450	0.23
Offal	388	160	0.62
Head	460	140	0.64
Leg	236	140	0.33
Lard (Hlap)	228	120	0.27
Total			**9.45**

Note: "Squash" can be drunk after dilution by twice the volume of water. "RTS" can drink as it is.
Source: MIFCO, Ltd.

The business of MIFCO Ltd. has been operating under unprofitable conditions and delay in payments of staff salary happened for seven months in 2011 in the Fruit Juice Concentrate Plant. The plants continue to operate due to the financial support provided by the state government.

Major constraints of the stagnant condition of the business are the following:

i) Decision-making is done by an executive board whose members have little knowledge on private business management because they are state officers and politicians;

ii) Board approval and decision-making takes a long time after request, and flexible adaptation of business management is difficult. Chance for profit is lost when raw materials are purchased where the purchasing price compete with other buyers and market price fluctuates regularly; and

iii) Food processing business is related to the fields of many departments and agencies, but they cannot receive effective collaboration supports among organisations due to the tight vertical administration structure of the government.

The state government, in 2008, launched the Mizoram Public Resource Management Programme to improve its finances through the support of the Asian Development Bank (ADB). In the programme, Deloitte Touche Consulting India Pvt. Ltd. (Deloitte) was employed by the government of Mizoram to study the function of the state government corporate bodies.

After conducting a thorough examination of the SOEs, Deloitte judged that MIFCO Ltd. have been incurring losses rather than earning profits for the government and it would be more profitable if the government privatise them. The state government is yet to take any action on the recommendations.

2) Community Development Action and Reflection (CDAR)

CDAR was established as a non-governmental organisation (NGO) in 2004 in order to support young women in poor farmers families to become self-supporting. Around the year 2006, they started the support activities for the marketing of products because many farmers faced difficulties in selling their own products. In fact, they started by receiving processing and drying machineries under a fund from the Council of Scientific and Industrial Research (CSIR) under ID.


Ginger Washing Drum


Ginger Slicing Machine


Sun Drying

Source: JICA Study Team

Photo 4.5.4 Condition of Ginger Processing

CDAR deal with ginger, turmeric, and bird-eye chilli and sell them to exporters mainly in Bombay after processing (wash and slicing) and drying. However, the market of turmeric has almost vanished during these years and they are having difficulty purchasing turmeric from farmers due to low price.

In contrast, the market condition of ginger is very stable in a high demand trend, and can be sold at the price offered to exporters without negotiation.

There are 5,440 farmers as members in 69 villages in five districts located in the north from Serchip. The Agricultural and Processed Food Products Export Development Authority (APEDA) authorised all farmers as organic producers. They produce organic products in their cultivation area that extends to approximately 15,448 acres.


Source : JICA Study Team

Photo 4.5.5 Drying Chamber (Shelf Type)

3) Mizoram Food Processing Industry (MIFPROY)

MIFPROY was established in the end of 2011 and started operation in May 2012. They have just started to process about 14 tons of ginger from November 2012 to May 2013 and produced 2 tons of ginger powder.

For the establishment of this business, in addition to their own fund, they received a grant support for the purchase of processing machineries under the National Mission of Food Processing through arrangement with ID and a credit from the State Bank of India for a period of five years with 13.5% annual interest. They are repaying the bank monthly, but since their business operation period is mainly from November to May only due to the production period of raw materials, the owner said that repayment during the lean season is a little tight for the management of their business.


Source : JICA Study Team

Photo 4.5.6 Packaging Machine

Their business condition cannot be evaluated yet because they just started. However, their development under the sustainable business condition will be expected by judging the owner's explanation of the future plan that is considered well by the market-oriented business theory. The owner pointed out that the biggest constraint for the development of their business is the difficulty in accessing credit suited to the borrower's condition, i.e., repayment period and condition, interest rate, and mortgage.

4.5.3 Implementation and Progress of the New Land Use Policy (NLUP)

(1) Micro-enterprises Components

In the Economic Livelihood Activities Sector of NLUP, micro-enterprises in various businesses have been supported for establishment through financial assistance on initial investment, training, and other requirements at about Rs.100,000 for each beneficiary. This sector, under NLUP, has already covered 18,362 beneficiaries out of the 10,730 in the first phase and 7,632 in the second phase. ID has implemented this program in consideration of the model project in various fields such as carpentry, black smith, shoe repairing, electric repairing, rickshaw service, automobile workshop, bakery, and

bamboo works. According to the staff of ID, the term "beneficiary" is defined as a unit of business similar to a business managed by a family.

However, ID does not have programs that would monitor and supervise the activities of beneficiaries after provision of financial assistance. Therefore, the business condition of each beneficiary is not clear.

Table 4.5.13 Number of Beneficiaries by Each Trade of NLUP

No.	Name of Trade	No. of Beneficiaries		
		1st Phase	2nd Phase	Total
1	Auto Rickshaw	69	194	263
2	Automobile Works	284	113	397
3	Bakery	89	61	150
4	Beauty Parlor	145	11	156
5	Black-smithy	165	116	281
6	Broom making	77	72	149
7	Cane and Bamboo Works	29	12	41
8	Carpentry-1	1,488	815	2,303
9	Carpentry-2	219	232	451
10	Chaw (noodle) Making	93	24	117
11	Desktop Publishing	152	83	235
12	Electric Repair	238	80	318
13	Hair Cutting	128	49	177
14	Headroom	181	102	283
15	Knitting	32	3	35
16	Leather and Hood Works	18	9	27
17	Petty Trade-I	4,321	3,573	7,894
18	Petty Trade-IV	78	50	128
19	Photography	135	60	195
20	Rice Milling	224	101	325
21	Square Agarbati	54	17	71
22	Steel Fabrication	121	70	191
23	Tailoring	1,110	307	1,417
24	Tin Smithy	119	31	150
25	SMB	1,161	1,447	2,608
	Total	19,730	7,632	18,362

Source: ID

Table 4.5.14 Year-wise Fund Allocation and No. of Beneficiaries (As of October 2013)

Year	Fund Allocation (Rs. in Lakhs)	No. of Beneficiaries
2010 – 11	1,100.00	10,730
2011 – 12	9,019.72	
2012 – 13	5,855.00	9,051
2013 - 14	Under disbursement	(Plan: 8,815)
Total	15,974.72 Total allocation plan: 21,556.72	19,781 Total plan: 28,596

Source: ID

(2) Essential Infrastructure Components

Other than the supporting component to the micro-enterprises above, NLUP proposes to include various infrastructure sub-components from minor irrigation facilities to banking facilities under the development components of each field such as agriculture, horticulture, fish farming, and animal husbandry. In these components, the "Rural Godown" and "Processing Units for Value Addition" are listed in the fields of post-harvest processing.

Table 4.5.15 Agro-processing Components under NLUP

Component	Fund Allocation (Rs. in lakhs)	Description
Rural Godown	15,990.00	Rural godown of three different capacities is planned to be constructed in 750 villages. 50 MT (12x6 m): 310 No. 100 MT (18x9 m): 220 No. 200 MT (27x12 m): 220 No.
Processing Units	1,162.82	Dryers for turmeric and ginger are planned to be introduced in six locations; Khawzawl, Lawngtlai, Lunglei, Serchip, Kolasib, and West Phaileng.
Processing Units for Fruits	1,000.00 400.00	Semi-processing unit in village level is planned to be installed in 200 villages. Two units of tung processing unit by Chinese technology is planned to be introduced.

Source: "Comprehensive Project under New Land Use Policy (NLUP) for Sustained Economic Development and the Uplift of the Poor of Mizoram", Government of Mizoram

(3) Marketing Cell in NLUP

As the recognition that various projects under NLUP scheme could not be explored and provide the ways and means of marketing the products to beneficiaries in the past, a marketing cell was recently formed to gap the bridge between production and marketing. However, they have not provided actual measures to solve the problem yet. This is an important subject to be solved for further implementation of projects under NLUP scheme.

4.6 Agricultural Marketing and Distribution

4.6.1 Policy, Regulation, and Plan

(1) National Level

The basic role of the Department of Commerce is to facilitate creation of an enabling environment and infrastructure for accelerated growth of exports and trade in India. Their development policy and strategy focus on the field of export, exclusively, as an output and of trade, and contribution to the national economy.

(a) Agricultural Market Reform

In order to overcome the limitations and constraints of the present agricultural marketing system, the Ministry of Agriculture, Government of India (GOI) formulated a Model Agricultural Produce Marketing Committee (APMC) Act/Rules. In this Act, the Ministry of Agriculture took this major initiative to set up an Empowered Committee of State Ministers, in-charge of agricultural marketing in 2010 to implement the reforms through adoption of the Model APMC Act and Model APMC Rules. Moreover, to suggest further reforms necessary to provide a barrier free national market for the benefit of farmers and consumers, and also suggest measures to effectively disseminate market information and promote grading, standardization, packaging, and quality certification of agricultural produce.

Only the State of Andhra Pradesh, Rajasthan, Maharashtra, Orissa, Himachal Pradesh, Karnataka, Mizoram (only Single point levy of market fee), (Madhya Pradesh (only for special license for more than one market) and Haryana (only for contract farming) have notified such amended Rules so far. The progress of APMC are summarized in the Table 4.6.1.

Table 4.6.1 Progress of Market Reforms as per major areas identified in Model APMC ACT

Sl. No.	Area of Reforms	States adopted the suggested area of market reforms
1.	Initiative for setting up of new market by any person, local authority or grower	Chhattisgarh, Goa, Assam, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand and Jharkhand
2.	Setting up of Special Markets and Special Commodity Market	Andhra Pradesh, Gujarat, Maharashtra, Karnataka, Nagaland, Sikkim, Tamil Nadu Tripura, Jharkhand and Uttarakhand
3.	PPP in Market Extension activities of Market Committee	Andhra Pradehsh, Himachal Pradesh, Karnataka, Nagaland and Sikkim
4.	To promote and encourage e-trading, Market Committee may establish regulatory system, create infrastructure and undertake other activities and steps needed thereto	Gujarat, H.P., Karnataka, Nagaland, Sikkim, Mizoram, and Goa and Maharashtra (under Rule 5 license granted to Commodity Exchanges registered under FMC) and Uttarakhand
5.	Secretary to be Chief Executive Officer of Market Committee. CEO shall be appointed by the Market Committee from the panel maintained by the Director/Board which may include professionals from open market.	Nagaland, Sikkim, Mizoram, Maharashtra (under Rule)
6.	Contract Farming Sponsor shall register himself with the Marketing Committee or with a prescribed officer in such a manner as may be prescribed.	Andhra Pradesh, Arunachal Pradesh, Assam, Goa, Himachal Pradesh, Karnataka, Haryana, Maharashtra, Madhya Pradesh, Mizoram, Nagaland, Orissa, Rajasthan, Chhattisgarh, Sikkim, Tripura, Jharkhand* and uttarakhand
7.	The contract Farming Sponsor shall get the contract farming agreement recorded with the prescribed officer.	Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Gujarat, Goa, Karnataka, Haryana, Madhya Pradesh, Mizoram, Maharashtra, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Jharkhand* and Uttarakhand
8.	No title, rights, ownership or possession shall be transferred or alienated or vest in the contract farming sponsor or his successor or his agent as a consequence arising out of contract farming agreement.	Arunachal Pradesh, Assam, Goa, Haryana, Maharashtra, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Jharkhand*, Andhra Pradesh, Karnataka and Uttarakhand

Sl. No.	Area of Reforms	States adopted the suggested area of market reforms
9.	Dispute settlement mechanism	Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Gujarat, Goa, Karnataka, Haryana, Madhya Pradesh, Mizoram, Maharashtra, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Jharkhand*; Himachal Pradesh and Uttarakhand
10.	Exemption of Market Fee on the sales to the contract farming sponsors taking place outside	Arunachal Pradesh, Goa, Karnataka (Reduced by 30%), Maharashtra, Mizoram, Nagaland, Orissa,

Source: Status of Agricultural Marketing Reforms, Gokul Patnaik, Workshop on Policy Options and Investment Priorities for Accelerating Agricultural Productivity and Development in India, Nov. 10-11, 2011, India International Centre, New Delhi

(2) State Level

The Trade and Commerce Department (TCD) of the state government is responsible for managing and regulating the trade and commerce activities concerning marketing and distribution of agricultural commodities. The department has regional offices in Lunglry, Champhai, and Kolasib districts other than its head office in Aizawl District, and presently has a total staff of 159.

The department gives priority to the improvement of the marketing aspect of agricultural produce by providing physical market infrastructures to protect the general interests of the farmers. Its main activities with respect to trading regulations in the state are the issuance of permit/pass/licence to traders for commodities notified under the Mizoram Trading Regulation; to monitor commodity movement beyond and into the state by putting in place four check gates and to collect stall rents in the market being operated by the department.

(a) 12th Five-Year Plan (2012-2017)

Major points of the Draft 12th Five-Year Plan (2012-2017) with respect to TCD are the following;

1) Agricultural Marketing

As stated in the provision of the Mizoram State Agricultural Produce Marketing (Development and Regulation) Act 2008, all districts, excluding those under autonomous district councils, have been declared as market areas. The agricultural practice in Mizoram has been steadily transforming from that of subsistence farming to commercial production. To prepare clearly for the perceived production increase in agriculture, TCD has planned to strengthen its function of facilitating agricultural marketing through its district offices in Lunglei, Champhai, and Kolasib, and the two new district offices in Mamit and Serchhip are also included in the proposal.

In addition, adequate funds have been provided for maintenance of the total 220 existing market infrastructures located across the state.

2) Grading and Quality Control

To improve the standard of crops and to ensure remunerative returns, grading and quality control measures have to be adopted, also these rewarding functions, trainings, and awareness seminars have to be conducted.

3) Border Trade

Mizoram shares the long and porous international borders with Myanmar and Bangladesh. People of similar ethnicity inhabiting in the areas on both sides of the international border continue to sustain their requirements through conducting mutually beneficial trading, albeit informal. A sustainable economic improvement of the people living along the borders located in far remote areas, would require organised system of trade, such as border *"haat"* (common village market), border trade, and preferably, normal trade in due course.

Mizoram has two notified land customs stations (LCS) in Zokhawthar (Champhai) and Tlabung, which are not functioning well yet.

Zokhawthar LCS has been provided with a composite Land Customs Station building and other requirements for border trade transactions in the agreed 62 items of trade (earlier it was 40 items).

Road connectivity to the proposed trade centre in Kawrpuichhuah (Indo-Bangladesh) has also been provided.

The traditional trade route over Chhimtuipui (Kolodyne/Kaladan) which links Sittwe Port (formerly Akyab Port) in Myanmar is also proposed to be developed through the Kaladan Multi–Modal Transport Project.

In line with the above, the state government targets the following points:

- Zokhawthar LCS may be equipped with transaction of normal trade. Upgrading of Zokhawthar LCS into an Integrated Check Point (ICP) is imperative in view of the sizable cross-border movement of people.
- The option of conduction Transit Trade with Thailand/China through Myanmar, using the existing LCS and the proposed LCS in Zorinpui site may be considered.
- A number of border *"haats"* may be developed along the international borders for the economic benefit of inhabitants in these areas.
- Bangladesh government needs to be urged to agree on the opening of counterpart LCS opposite to the existing LCS's on the Indian side as well as to build its access to Chittagong Port.

The proposal for the development of ICP in the northeastern states including Kawrpuichhuah (Tlabung) may be vigorously pursued.

4) Miscellaneous

The commercial infrastructures proposed to be taken up during the 12th Five-Year Plan Period are essentially those aimed for export. Such inclination has been made so that the state could be in tandem with the renewed focus of GOI to forge closer commercial and economic ties with the markets of the neighbouring countries with particular emphasis on the Southeast Asian economies. Apart from provision of requisite infrastructures, TCD has also proposed to provide the necessary thrust for commercial development through the provision of avenues to educated youths for developing their entrepreneurship and providing adequate trainings and exposures.

Table 4.6.2 Planned Outlay during the 12th Five-Year Plan

(In Rs. lakhs)

Schemes	12th Five-Year Plan (2012-2017)	Annual Plan 2012-2013
Other Agricultural Programme, Marketing and Quality Control, Marketing Facilities	1570.00	314
Grading and Quality Control	30.00	6.00
Cooperation on other Agriculture Programme (Investment in the Private Sector and Other Undertakings)	150	30
Total	**1750.00**	**350**

Source: TCD

4.6.2 Distribution of Agricultural Products and Stakeholders

(1) Markets

TCD directly manages 22 major markets and 198 markets indirectly through the local councils of Mizoram districts and village councils in other districts. These markets not only provide venues for selling agricultural produce within the state but also employment to a number of people, particularly women. Number of markets by district are compiled in Table 4.6.3.

Source: JICA Study Team

Photo 4.6.1 Roadside Market, Dulte, Champhai District

Table 4.6.3 Markets in Mizoram under the Trade and Commerce Department

	Market	District								Total
		Aizawl	Mamit	Serchip	Kolasib	Lunglei	Champhai	Saiha	Lawngtlai	
A	Total no. managed by TCD directly	7	1	1	4	7	2			22
B	Total no. managed by local councils	22								22
C	Total no. managed by village councils	46	17	17	19	29	42	3	3	176
Grand Total		75	18	18	23	36	44	3	3	220

*Source: TCD Note: ** Wholesale market*

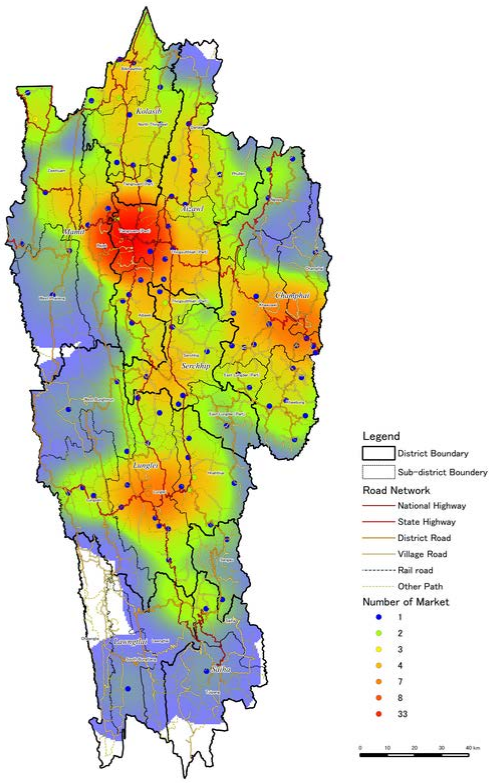
Among the total 220 markets, 176 are managed by the village council (VC), village markets, and roadside markets.

Market location and density are analyzed and indicated on the map shown in Figure 4.6.1. The colour gradation between high accessibility in red and low accessibility in blue on the map shows the accessibility of each area to the markets.

For better regulation and proper administration of markets, the Mizoram State Marketing Board was constituted by the Mizoram State Agricultural Produce Marketing Act 1996. Through this board, marketing committees were constituted in major markets such as New Market in Aizawl, Vaivakawn Market, Bawngkawn Market, and Vairengte Market.

Recently, GOI formulated the Model APMC Act on Agricultural Marketing within the states for the marketing reforms of India. However, the state act has not been reviewed and amended in conformity with the model act because the markets in Mizoram are small as producers and buyers are less compared with other states. As a result, the markets in the state are not well regulated yet.

The market facility condition of major towns does not have serious defects except the meat and fish area. The area should be improved with reference to the sanitary condition required by the hygiene regulations.



Source : JICA Study Team

Figure 4.6.1 Market Accessibility Map

The data on the annual trading amount of three major markets in Aizawl provided by TCD shows a very steady increasing trend during the last four years, and the integrated development plan of all markets in Aizawl will be necessary to absorb such increasing condition.

Table 4.6.4 Annual Trade Amount of Major Markets in Aizawl

	2007 - 08		2008 - 09		2009 - 10		2011 - 12		2012 - 13	
	Volume (ton)	Lakh (Rs.)	Volume (ton)	Lakh (Rs.)	Volume (ton)	Lakh (Rs.)	Volume (ton)	Lakh (Rs.)	Volume (ton)	Lakh (Rs.)
New market	260	52.0	280	56.0	300	60.0	420	84.0	560	112
Bawngkawn	45	9.0	56	11.2	67	13.4	80	16.0	95	19
Vivakawn	52	10.4	59	11.8	68	13.6	79	15.8	105	21

Source: TCD

Actually, the department selects and contracts with a private firm who manages the market through a bid every six months, even it is called “directly managed by TCD”. According to the interview survey, the rate of market fee for retailers differs among markets, even though the rate is regulated by the department.


New Market (Aizawl)


Meat Shop (Super Market, Lunglei)


Fish Shop (Treasure Market, Aizawl)

Source : JICA Study Team

Photo 4.6.2 Retailors' Stalls of Market

(2) Border Trade to/from Other States

In order to protect farmers in Mizoram from unhealthy marketing competition with middlemen and others in other states, the Mizoram Agriculture Products (Prohibition of Movement) (Amendment) Order was enacted on 14 July 1999.

However, TCD has not contributed to meet the objectives for protecting farmers well through management of the order. The detail condition of iconstraints that farmers face to is explained since (4) in this section.

Major points of this order are reproduced as follows:

Table 4.6.5Rate of Market Fees of Typical Products

Name of Product	Rate*
Chicken	15
Fish	15
Eggs	8
Betel nut	8
Rice	8
Local vegetables	8
Imported products	15
Pork, goat, beef, or other meats	25/ head
Potato/onion	8
Imported vegetables sold in the market to retailers and big consumers	10 per tukri**/box/bag
Local vegetables sold in the market to retailers and big consumers	5 per tukri **/box/bag

*Note: *per sales area excluding specified ** Bamboo basket*
Source: TCD

- The order extends to the whole Mizoram except to the three autonomous district councils of Mara, Lai, and Chakma.
- The "agricultural produce" subject by the order are 138 items, as follows; three types of cereals, nine types of pulses, ten types of oil seeds and edible oils, 28 types of vegetables, 21 types of fruits, 16 types of spices and condiments, two types of fibres, two types of sugar and starches, five types of plantation crops, two types of narcotics, 12 types of forest products, 12 types of animal husbandry products, five types of sericulture products, three types of medical aromatic plants/essential oils, and eight types of ornamental plants.
  (The above list covers almost all commercial produces in Mizoram.)
- No person shall be allowed to transport "agricultural produce" to any place beyond and into the state of Mizoram except under a permit issued by the state government or any other officers authorized by the government.
  (TCD is the sole organisation authorized by the government to issue permits)


Source:JICA Study Team

Photo 4.6.3 TCD Check Gate Office, Vairengte

In this regard, TCD has check gate offices in Vairengte (Kolasib District), Bairabi (Kolasib District), Kanhmun (Mamit District), and Mualkawi (Champhai District) and checks movement and records commodities' name, volume, destination, and other requirements. Moreover, TCD collects permit fees if in case a transporter does not have one.

The permit fee by commodity is as follows:

Table 4.6.6 Permit Fees by Commodity

Item	Typical Commodities	Rate (Rs.)
1.Cereals	Rice, Maize, Paddy	10/Qtl.
2.Pulses	Chick pea, Cow pea, Gram, Soya bean	10/Qtl.
3.Oil Seeds and Edible Oil	Caster, Ground-nut, Mustard, Sesame	10/Qtl.
4.Vegetables		10/Qtl.
5.Fruits		10/Qtl.
6.Spices and Condiments	Cardamom, Cinnamon, Coriander, Mint, Pepper, Tamarind Turmeric Garlic, Vanilla, Clove, Chilli, Ajinomoto	10/bag 40/Qtl. 50/Qtl.
7.Fibres	Cotton, Jute	10/Qtl.
8.Sugar and Starches	Tapioca, Sugarcane, Sugar	10/Qtl.
9.Plantation Crops	Areca palm, Coffee, Tea, Papo rubber, Cocoa	10/Qtl.
10.Narcotics	Betel Leaves Tobacco, Betel Nuts	10/Tukris 10/Qtl.
11.Forest Products	Bamboo Flowers Timber, Baheda Teak Honey	1/piece 5/bundle 5/piece 5/log 10/litre
12.Animal Husbandry Products	Cock and Hen Duck Eggs, Fish Cattle, Pig Goat, Sheep, Piglet Ghee, Hide and Skin, Wool	20/Tukris 10/Tukris 10/box 20/head 10/head 10/Qtl.
13.Sericulture Products	Silk Products	10/No.
14.Medicinal Aromatics Plants/Essential Oils		10/Qtl.
15.Ornamental Plants	Rose, Jasmine, Orchid's, Gladiolus, Chrysanthemum, Anthurium	5/bundle

Source: TCD

(3) International Trade

The Ministry of Commerce and Industry of GOI has appointed TCD as the nodal department for the promotion of border trade with neighbouring countries of Myanmar and Bangladesh.

The international trade gates of Mizoram are proposed in three gates except in Aizawl Airport:

- Zokhawthar, Champhai District for Indo-Myanmar trade;
- Kawrpuichhuah (Tlabung), Lunglei District for Indo-Bangladesh trade; and
- Zorinpui, Lawngtlai District for Indo-Mynamar trade.

According to the recent information by TCD staff, TCD proposed three more border gates in Myanmar, namely, Vaphai and Farkwan both in Champhai District, and Sangau in Lawngtlai District as subgates to Zokhawthar and plans to construct border trade centres (BCTs).

At present, 62 items of commodities are allowed for export and import trading by the Directorate General of Foreign Trade of GOI. The Custom Department is the responsible organisation under TCD for international trading, and issues permits to traders who intend to export or import commodities. At the land custom office of the border, custom officers check and supervise the condition of the commodities in conformity with the description stated in the permits.

Table 4.6.7 List of Commodities Permitted for Export/Import

1	Mustard/Rapeseed	2	Pulses and beans
3	Fresh Vegetables	4	Fruits
5	Garlic	6	Onion
7	Chillies	8	Spices (excluding Nutmeg, Mace, Cassia, and cloves)

9	Bamboo	10	Minor Forest Products (e.g., Teak)
11	Food Items	12	Betel Nuts and Leaves
13	Tobacco	14	Tomato
15	Reed Broom	16	Sesame
17	Resin	18	Coriander Seeds
19	Soya Bean	20	Roasted Sunflower Seeds
21	Katha	22	Ginger
23	Bicycle Spare Parts	24	Life Saving Drugs
25	Fertilizer	26	Insecticides
27	Cotton Fabrics	28	Stainless Steel Utensils
29	Menthol	30	Agarbati
31	Spices	32	Cosmetic
33	Leather Footwear	34	Paint and Varnishes
35	Sugar and Salt	36	Mosquito Coils
37	Bulb	38	Blades
39	X-ray Paper and Photo Paper	40	Imitation Jewellery

Source: TCD

On the other hand, inhabitants living in both sides of the border area are of the same race and have been exchanging and trading their produce with each other through informal basis in the past years, just like within the same community.

Due to the recent trend of economy and politics in Asian countries in the far east and in the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) countries[1], the Indian government decided to give emphasis on strengthening the border trade with Myanmar and Bangladesh, and has just started the construction of infrastructure including access roads and offices attached to the border gate. Then, official activities including the opening of a customs office at the border gates has not been organised and regulated yet.

The condition and progress of infrastructure development differ in each border gate as Zokhawthar to Myanmar and Tlabung to Bangladesh, as of March 2014. In Zokhawthar, there is already a bridge and an integrated office facility constructed recently. It seems that formal and regulated official procedures and activities concerning border trade with Myanmar can start soon.

On the contrary, even though political and protocol agreement was exchanged by both countries, the official procedure to open the formal trading gate in Korupuichhah, Tlabung has been delayed and has not progressed well. For example, the Indian side has decided the bridge construction site for the Korpui River crossing and proposed it in the Bangladesh side. However, the Bangladesh side has not officially accepted the plan yet.

Border Gate to Myanmar, Zokhawthar

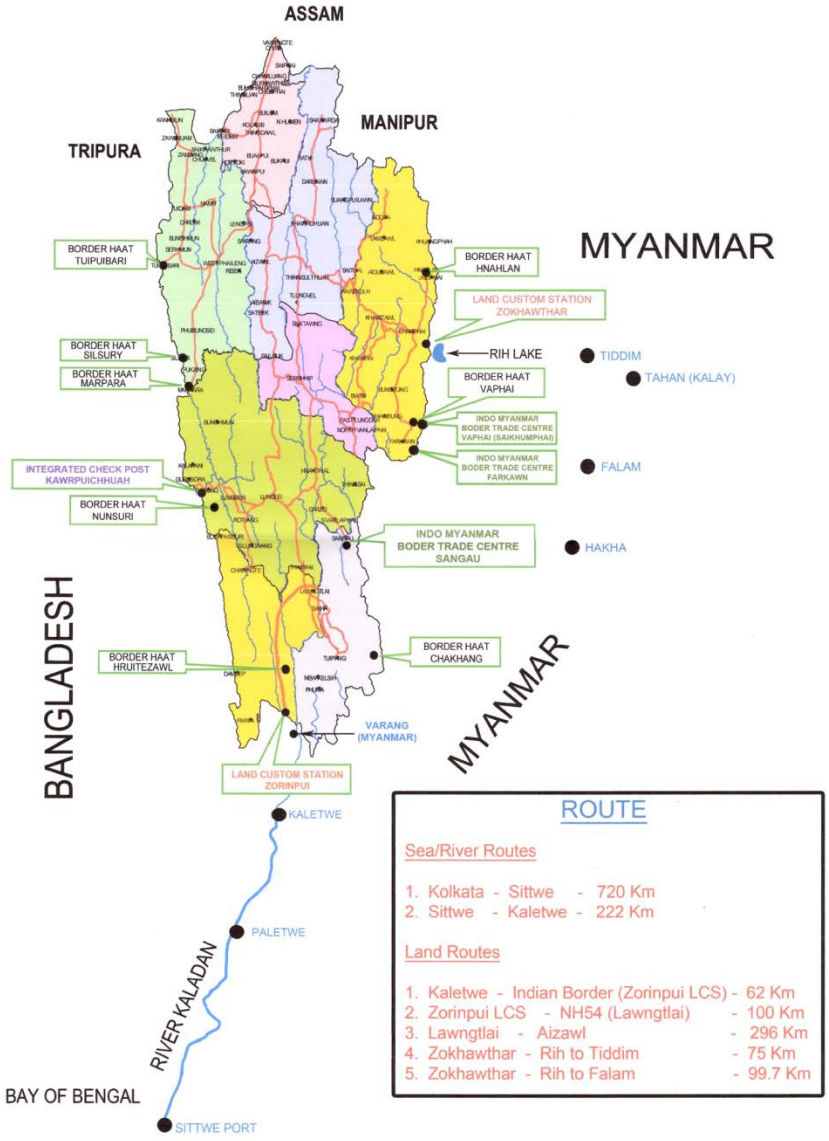

Police Office at the Border Gate, Zokhawthar


Transit of Commodities Crossing the Border, Zokhawthar

Souece : JICA Study Team

Photo 4.6.4 Condition of Zokhawthar

[1] Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation, members are India, Nepal, Bhutan, Bangladesh, Myanmar, and Thailand.




Border River to Bangladesh


Inhabitants Crossing the Border Freely, Korupuichhah


Border Bridge Construction Site Facing Bangladesh

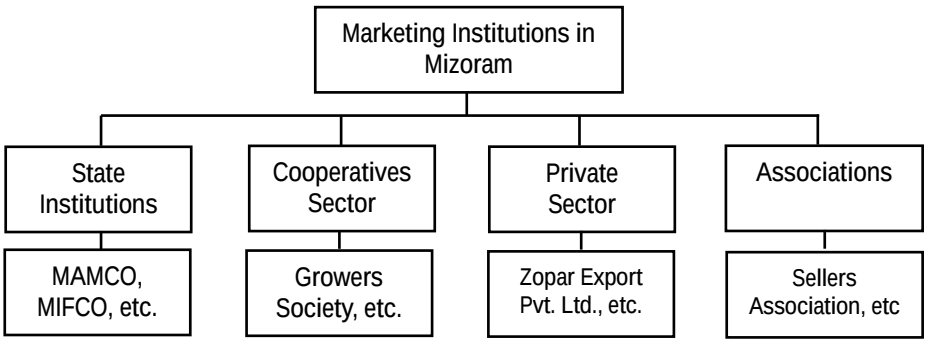
Source: TCD

Figure 4.6.2 Plan of Border Trade Facilities in Mizoram

(4) Overview of Marketing Institutions

The term *marketing institution* can embrace a wide range of organisations – including associations of farmers, traders, and others in the distribution channel, as well as cooperatives and government marketing agencies. It is considered as one of the key infrastructure for the development of agriculture.

The existing agricultural marketing institutions of the state can be broadly divided into four, namely, state institutions, private institutions, agriculture cooperative societies, and associations. Each of these bodies is further divided into a number of segments depending on their basic purpose and activities. For example, non-governmental organisations (NGOs)/association can take the form of vegetable sellers associations, growers (cum marketing) association, wholesale dealers association, etc. Figure 4.6.3 presents an organisational outline of these institutions.



Source: Market Survey, JICA Study Team

Figure 4.6.3 Organisational Chart of the Agricultural Marketing Institution in Mizoram

(a) State Institutions

Public intervention in commodity marketing is an ingredient to protect the interest of various sections of the society, farmers, businessmen, consumers, etc. This is more important for agricultural produce marketing because farmers are often exploited by traders and middlemen. Recognizing this fact, the Mizoram state government has also attempted to regulate commodity markets in the state. At present, TCD has taken up such responsibility at present.

The role and activities of TCD are referred to the description discussed in the previous section of the report. Other state institutions working for the marketing of agricultural commodities are described as follows:

The Government of Mizoram has instituted the Mizoram Agriculture Marketing Corporation (MAMCO) Ltd. as a state undertaking on 26 February 1993. The main objectives of this corporation are as follows:

- To undertake, assist, finance, and promote business of purchase, sale, storage, processing, export, and import of agricultural produce;
- To render services of all types with or without consideration to the farmers in production and sale of agricultural produce;
- To provide minimum support price for agricultural produce and also to make commercial purchases and sales; and
- To promote or conduct the establishment of any commercial or industrial enterprise or company of concern for agricultural produce.

MAMCO Ltd. was engaged in the marketing of eight major cash crops of the state, i.e., ginger, chillies, sesame, turmeric, squash, orange, hatkora, and tung. It was authorized to issue permit for the movement of these products beyond the state of Mizoram. Later, the Government of Mizoram declared this corporation as a nodal agency authorized by the state government for marketing ginger, chilli, sesame, cotton, and turmeric.

From 1999 to 2000, it started to purchase ginger, chilli, turmeric, and cotton at specified rates from the farmers through appointed contractors. These contractors were expected to sell the same to other parts of the country for domestic consumption or exports. This system lasted until 2007-08. A free sale policy, which was found to be less ineffective than the former, was then adopted from the harvesting season of 2008-09. To date, this policy exists side by side with its direct purchase policy.

Like MAMCO Ltd., the thrust area of Mizoram Food and Allied Industries Corporation (MIFCO) Ltd. is the rapid development and promotion of the food processing industries in Mizoram, rather than marketing of unprocessed products in and outside the state. The role, activities, and constraints of MIFCO Ltd. are described in Subsection 4.5.2 (2).

(b) Cooperative Institutions

Cooperative movement also makes substantial contribution in the promotion of agricultural produce marketing in Mizoram. The first cooperative society named “The Aizawl Trading Cooperative Society Ltd” was established in 1949. At present, there are 1,400 cooperative societies including 11 state-level cooperative societies in various categories. The activities taken up by these cooperative societies differ according to the nature of their formation and objectives.

While dealing with marketing institutions in the state, one cannot overlook the significant contribution of various cooperative societies in promoting agricultural marketing in the state.

A brief outline of the typical cooperative marketing societies and their role in marketing is discussed below.

1) State-level Cooperative Societies

The Mizoram State Cooperative Marketing and Consumers Federation (MIZOFED) was initially created for marketing of agricultural goods and procurement of certain cash crops, minor products, etc., from small farmers and individuals. However, due to one cause or the other, it failed to make much headway and often incurred financial losses. At present, this institution does not have interest in marketing farm produce and has completely switched over to the dealership of POL, liquefied petroleum gas (LPG), and other manufactured goods. On the other hand, the main role played by the Mizoram Multi-commodity Producer Cooperative Union Ltd. (MULCO) is the procurement, processing, and distribution of milk products in Mizoram. Presently, there are 34 societies in the state registered under MULCO. Meanwhile, the main activities of the remaining cooperative societies were indicated by the name of the society, i.e., fish production for the Mizoram Cooperative Fish Farming Marketing and Processing Federation Ltd. (ZOFISFED), pig for the Mizoram Pig Producers' Cooperative Federation Ltd. (PIGFED), and so on.

2) Primary Cooperative Societies

There are 1,389 societies, of which many are involved in the marketing of agriculture produce directly or indirectly. Almost half of the primary societies are engaged in agriculture and allied and livestock activities. Accordingly, the cooperative institutions with its different form from primary levels to the apex levels have occupied important places in the cultivation and marketing of agricultural produce in the state.

(c) Private Institutions

Private stakeholders constitute a major portion of the commodity flow in the market. However, it is hard to find private marketing stakeholders working on an organised basis. Although there are a number of such organisations including NGO's in the state, the same existing private institutions are introduced as follows:

- Hnamchhantu Pawl (HCP) is involved in the purchase, processing, and marketing of brooms in Mizoram, and is the most prominent marketing channel of broom in the state;
- Zopar Export Private Limited (ZEP) is involved in the marketing of anthurium flowers from the state to domestic and export markets;
- All Mizoram Farmers Union (AMFU) and Mizoram Cultivator and Labour Union (MICLUN) are farmers' organisations that work for the development and improvement of farming practice, production, and marketing of agriculture in the state; and
- Community Development Action and Reflection (CDAR) was set up in 2007 for the upliftment of the poor and marginalized section of the society. This organisation works for the processing and marketing of ginger and chilli in the state. More information is given in Subsection 4.5.2 (2).

(d) Trader of Other States

At the same time, traders (floating traders) coming from other Indian states occupy a crucial part in the marketing of agricultural products. They are called *Marwari*, the name of one Indian ethnic group of Rajasthan origin, and are known for their business skills and trading success in the country. These people frequent the state, even the interior areas, throughout the year to procure surplus production of cash crops. They transport the commodity purchased from the farmers to their base, generally located in Cachar District of Assam. The commodities that they generally procure from the state are ginger, chilli, betel nut, orange, squash, turmeric, banana, and broom. It had been experienced that harvest season for some of the cash crops of Mizoram is influenced by the time the *Marwaris* arrive in the local villages. Moreover, they are also the main agents for the import of vegetables from other states like potato, fish,

cabbage, cauliflower, onion, and garlic. Therefore, these agents play a significant role in the flow of agricultural products to and from the state.

(e) Associations

Traders or farmers dealing in the same commodities in certain areas usually form themselves in associations in order to protect their welfare. Therefore, there is a complicated network of associations of different sorts in the state which are very influential in their respective areas in terms of price controls and prevention of the entry from outside. These associations take different forms at various levels, village, block, district, state, and specific area (markets). With respect to marketing of agriculture produce, these associations may be broadly classified into three major groups as farmers/producers/growers, wholesalers/commission agents, and retailers associations.

Source:JICA Study Team

Photo 4.6.5 Public Small Bus "SUMO"

1) Growers/Farmers/Producers

Growers or farmers organise themselves in associations at different levels of state, district, and the like. Some of the examples are Mizoram Iskut (Squash) Growers Association (MIGA), Brooms Cultivators Association of Mizoram (BCAM), ginger growers associations in various villages, and Arecanut Growers Association. These associations provide logistics for cultivation and the marketing of their products to the producers. They try to protect their members from unwanted situations like exploitation by traders and marketing intermediaries. For example, MIGA acts as the main institution for marketing squash in Mizoram. Similarly, ginger growers association in various villages are taking active steps to ensure remunerative procurement prices of ginger in their respective village areas.

2) Wholesalers/Commission Agents

There are associations of middlemen/wholesale commission agents. A good example for such association would be Mahni Thlai Zuar Association (MTZA). Members of this association purchase vegetables and fruits from the producers in different parts of the state and sell them to the retailers in nearby market stations, generally in Aizawl and other district capitals. As far as possible, the MTZA fixes the minimum procurement and wholesale prices that the members have to follow while dealing with such commodities in order to avoid price competition among them. However, depending on the venue and means of available communication, this association sometimes allows variation in the procurement prices. The role of middlemen/wholesalers could also be seen from the experience of the Mizo Panhnah Zuar Association (MPZA, Mizo Betel Leaf Sellers Association). In an attempt to protect them from price competition that may arise because of non-local dealers of the same commodity, they recently put a ban on the import of betel leaf by outside traders. As a result, non-local traders of this commodity put blockade of the same in the Cachar District of Assam, the main route of imports to Mizoram. As a result of this misunderstanding, supply of the commodity reduced significantly for a few weeks.

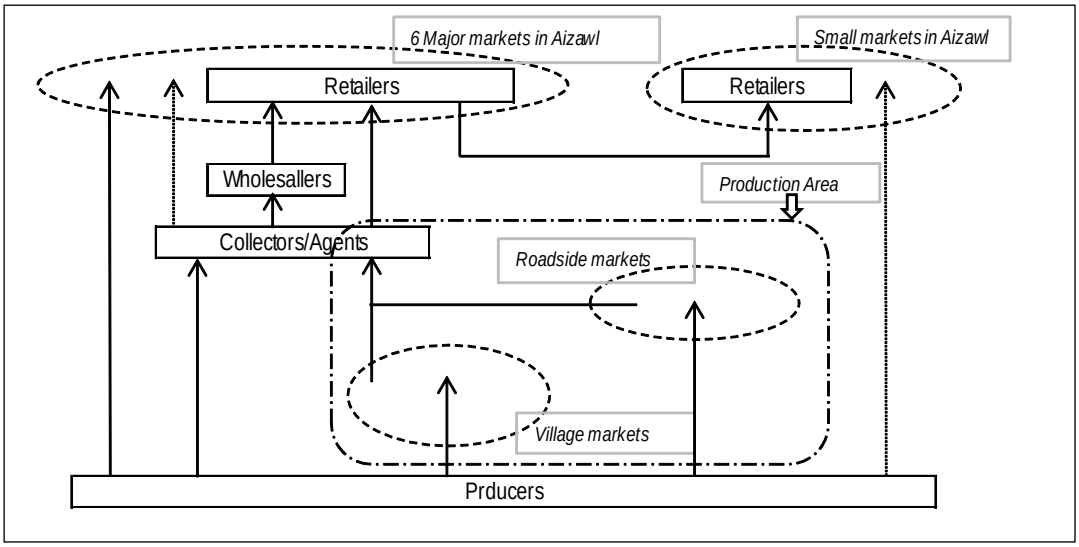
3) Retailer's Associations

Retailer associations occupy a very important place in the marketing of agricultural products in the state. It was found that there are associations such as the Vegetables Sellers Association, New Market, Aizawl, and Bazaar Thu Association (Bazaar Vendors Association). The main objective of these associations is to protect the retailers against losses resulting from price competition. It imposes regulations on the retail prices in their respective market areas. Although they usually fix prices for different commodities, they also allow heavy price reduction to enable these vendors sell at distress sale in order to avoid spoilage of the commodities.

(5) Distribution at the Village Level and to Near Town Markets

Farmers in Mizoram give priority to self consumption of their agricultural produce, and then their surplus produce such as vegetables in small volume are sold at village markets and roadside markets

within their area. In some areas farmers produce more volume of products to earn more cash. Some transport their produce to the nearest big town markets by "sumo", public small bus, and sell them to retailers or consumers directly. Collectors also carry the products to the nearest big markets like Aizawl and sell to retailers. Moreover, some farmers behave like collectors after gathering the products from neighbouring farmers.



Source: Market Survey, JICA Study Team

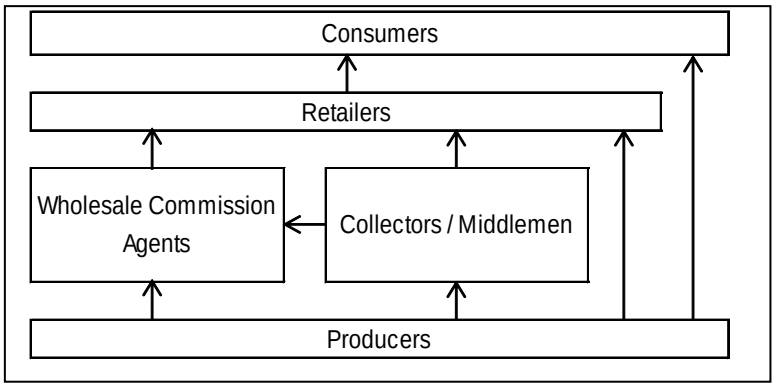
Figure 4.6.4 Distribution Chart in the Production Area and to Aizawl Market

In the distribution of local products above, the stakeholders are classified into four groups as described in Table 4.6.8.

Table 4.6.8 Characteristics of Stakeholders

Stakeholder	Characteristics
Producers	Generally, they sell their produce to collectors or wholesale agents who come to their villages. At the same time, some producers transport their produce to markets located in towns/cities (Aizawl) and sell them directly to consumers or retailers (vendors).
Wholesalers / Wholesale Commission Agents	They are the traders who collect or procure the commodities from the producers and sell it in bulk to the retailers who would further sell the commodities to the consumers. They or their agents would go to different parts of the state to collect the vegetables from farmers and then sell them to retailers in the nearby town/city market places. As mentioned earlier in the previous section, members of MTZA (Owned Produced Vegetables Marketing Association) are the main actors. Although members of MTZA declare themselves to be farmers they, in fact, act as wholesalers or as a link between producers and retailers.
Collectors / Commission Agents	They are marketing agents who act as a link between producers and wholesalers or retailers. They earn profit in the process of collection, storage, transportation, and distribution of commodities. It may be noted that there are individuals in the villages who collect surplus produce of vegetables in their respective villages for onward delivery to the wholesale dealers. At the same time, some well-to-do families of the village or from other villages, who usually have transport vehicles, collect these commodities from the villages, transport and sell them to retailers operating in urban areas at the prevailing wholesale prices, thus, earning certain amount of profits in the chain. These agents are also considered collectors.
Retailers	They are the marketing agents who are in direct contact with consumers. There are some instances where wholesalers are also involved in selling commodities directly to consumers. Similarly, the producers are also selling their produce directly to consumers by retailing it at certain marketing areas. It is a common practice to market the products through any of the abovementioned channels.

Source: Market Survey, JICA Study Team



Source: Market Survey, JICA Study Team

Figure 4.6.5 Distribution Chart at the Village Level and to Near Town Market

(6) Long Distance Distribution

In addition to the above distribution, some local produce such as squash and ginger, which have markets in other states, are bought by collectors or commission agents and transported to wholesalers/brokers in other states, mainly in Silchar, Assam State. The commission agents are usually agents of the wholesalers/brokers that act as buyers in other states. For example, there are five agents in Sihphir Village which collect and buy squash in the village, and ship them to wholesalers in Silchar by trucks.

Additionally, distribution beyond a district border in Mizoram State is broadly observed for local produces. For example, vegetables produced in Sihphir in Aizawl District are sold to markets in Kolasib in the north, even in Lunglei and Saiha in the south, after transportation by collectors. As indicated in Table 4.6.9, other than the direct distribution by collectors from production area, distribution via wholesalers in Aizawl is common to almost all town markets within the state. Thus, the surplus products in the production areas along the good road networks, like the national highway, are also distributed to distant big town markets seasonally and timely according to market demand.

An interesting feature is that Aizawl Market is the main place for market arrivals of not only local vegetables but also imported ones among all other markets in the state, such as the central market of the state. However, the major products coming in the state are sold in big volumes throughout the year such as potato, onion, garlic, and egg, they have direct distribution channels to local markets even to Champhai, Saiha, and Tlabung managed by wholesalers in Silchar.

It is generally accepted that various vegetables, irrespective of its quantity, could be grown and produced anywhere across the state wherein *jhumming* is practised. Whatever the case is, the state has not been able to produce enough quantity of these commodities especially during off season and has to import the same from outside sources. Attempt was made to identify the main feeders of the sampled market places covered during the market survey and is presented in Table 4.6.9.

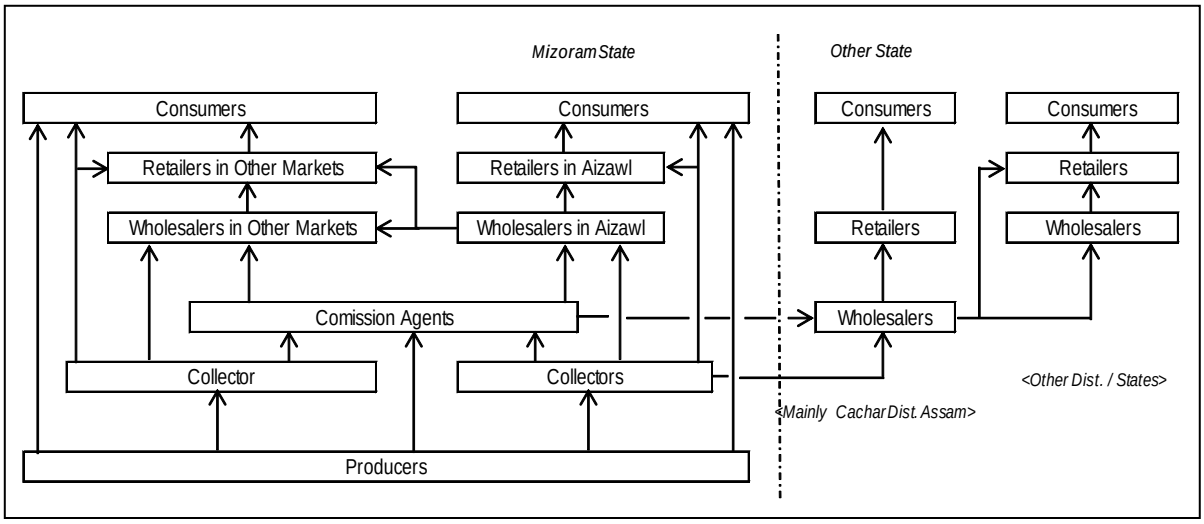
It is noted that rice, a staple food in Mizoram, are imported at more than 80% of the estimated total consumption of 180,000 MT annually, mainly under public distribution system (See Subsection 3.2.4 (2)). Only 1,500 MT (0.8%) of rice is imported and distributed commercially according to the records of TCD. Therefore, some parts of the local production totalled to 40,000 MT and 1,500 MT mentioned above, which is less than 20% of consumption, are only distributed and sold in town and village markets.

Table 4.6.9 Main Producers of Vegetables Sold in Selected Markets in Mizoram

Market Place	Main Producers (Feeders)
Aizawl	Sihphir, Durtlang, Lungdai, Sairang, Maite, Tuirini, Keifang, Sesawng, Tualbung, Saitual, Samlukhai, Thiak, Zawlpui, Thingsulthliah, Mualpheng, and Dilkhan; *Assam, Meghalaya, Myanmar*
Seling	Sihphir, Aizawl bazar, Tuirnini, Maite, Sihfa, Tuirial, Seling, Thingsulthliah, Tualbung, and Mualpheng
Champhai	Champhai, Ruantlang, Dilkawn, Zote, Tuipui, Zotlang, Hmunhmeltha, Leisenzo, Mualkawi, Aizawl Bazar, and *Myanmar*
Serchhip	Serchhip, Zawlpui, Sihphir, Durtlang, Khawlailung, Sialsir, Aizawl Bazar, and Hriangtlang
Lunglei	Aizawl Bazar, Tuichawng, Tlabung, Sihphir, Durtlang, Hauruang, Theiriat, Pukpui, Zawlpui, Phairuangkai, Tuipui D, Leite, and Ralvawng

Saiha	Aizawl Bazar, Lungdai, Sihphir, Bualpui S, Cheural, Theiva, Siachangkawn, S. Lungpher, and Vawmbuk

Source: Market Survey, JICA Study Team



Source: Market Survey, JICA Study Team

Figure 4.6.6 Long Distance Distribution Chart of Local Products

(a) Findings of the Market Survey

The JICA Study Team formed the Market Survey Team headed by Dr. James L.T. Thanga, Mizoram University, and conducted the survey from November 2013 to January 2014. About 20 major commodities were selected and the survey team tried to collect information to clarify marketing channels, stakeholders engaged in trading and distribution of commodities and value chain condition. The survey team visited five major markets, namely; Aizawl, Seling, Champhai, Serchip, and Lunglei and interviewed many stakeholders.

1) Lemon

The locally produced lemon (called *'nimbu'* in local dialect) is also marketed in two forms – unprocessed and processed (juice). There are some local traders engaged in the extraction of lemon juice using homemade tools, who sell them to consumers directly or indirectly through retailers. These individuals collect the unprocessed lemon from the farmers or middlemen for processing. At the same time, selling of lemon in its original form occupies a prominent place in the local market.

2) Orange

There are two main marketing venues for oranges in the state, namely, local and export markets. The main actors in this channel are the middlemen, local or non-local, who purchase the commodity from the farmers and transport it to other places. It was reported that a major portion of the produce is sold outside the state through these middlemen (usually commission agents). After being purchased and kept in storage areas in other states, a certain amount is again bought back from outside the state by local retailers during off season. Further, there is a huge marketing opportunity in other parts of the country for this product.

Selling of oranges to non-local middlemen (commission agents) by farmers is done in two ways: (i) before the start of harvesting season, these agents, normally from Assam, would come to the village to commission the orange on tree basis at agreed price between them and the producers; and (ii) when the producers have started harvesting, these commission agents would come to collect the commodity and pay the price quoted by the producers. These agents would transport the same to big wholesale dealers in other states (Assam) for further processing. At the same time, some local middlemen (collectors) also sell the commodity to retailers operating in different market stations within the state, while some producers themselves prefer to deliver it directly to retailers in the market places, especially in urban areas of the state.

3) Squash

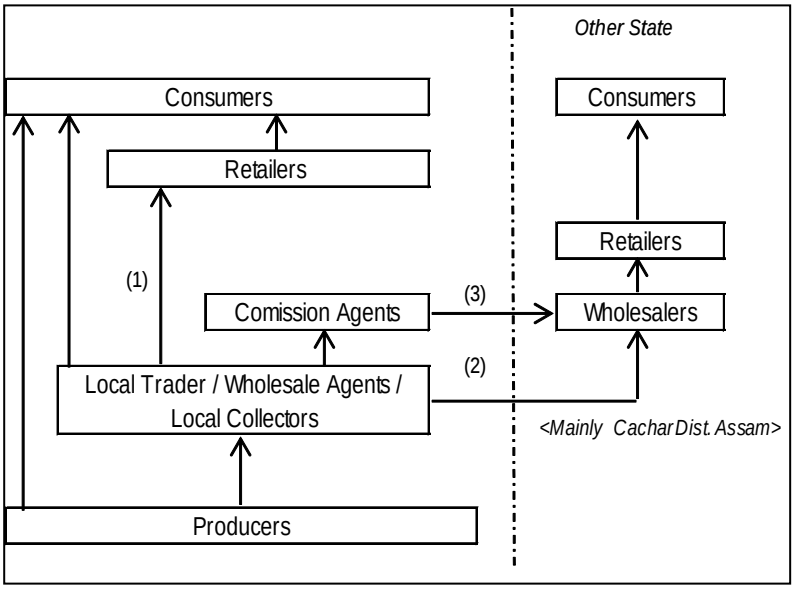
Source : JICA Study Team

Photo 4.6.6 Shipping of Squash, Siphir Village

Squash cultivation is characterised by relatively well-organised marketing channels compared with other cash crops grown in the state. Harvesting season starts at the onset of monsoon during April-May when its price starts rising; and its price drops during peak season, August-September. This crop shows a

long harvesting period lasting up to January of the next year. They have to sell the commodity right after harvesting to whatever marketing institution is available at that time. A notable feature of its marketing is the role played by MIGA, which functions as an institution to counter-balance the possible price competition arising from monopolistic control by traders or trading establishments and other marketing establishments.

Upon thorough examination of the existing market flow, there are three main marketing channels for this crop. They are shown in Figure 4.6.7.



Source: Market Survey, JICA Study Team

Figure 4.6.7 Major Marketing Channels of Squash

First, due to increased consumption within the state, channel-(1) occupies a prominent place in the marketing of squash. The main actors in this channel are wholesale commission agents, who have direct contact with producers and transport the commodities to retailers operating in different market places of the state. They organise themselves in MTZA, and actually function as wholesalers, in addition to the marketing of their produce. Depending on the prevailing producer's price, MTZA has strong influence on the wholesale price of squash.

Second, local traders play an important role in channel-(2). They collect the commodities in and around their villages and carry the same in bulk to wholesale dealers operating in the market terminals of Assam and earning a certain amount of profit in the process.

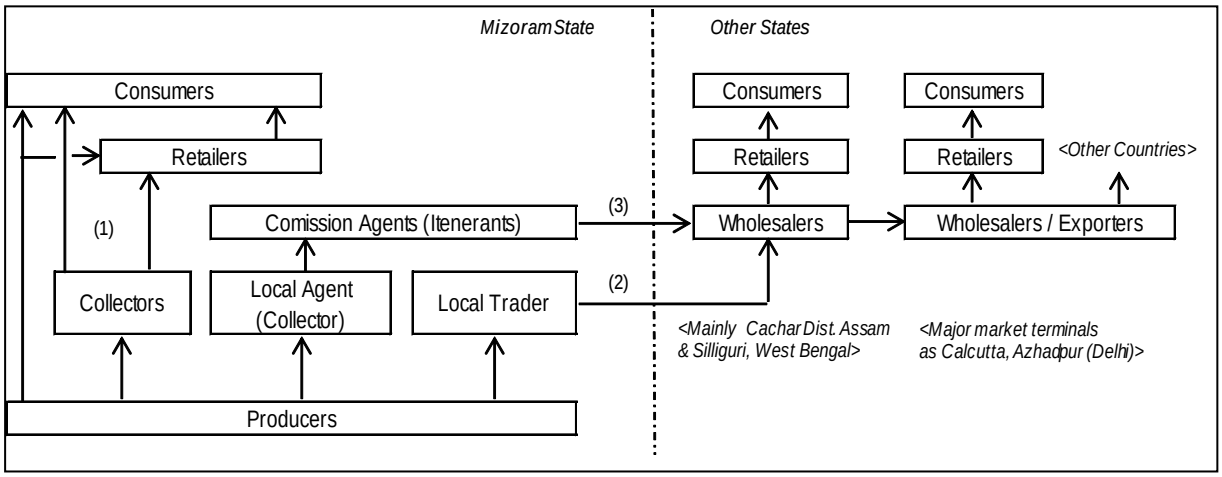
Third, it is observed that middlemen are facilitating local men with funds and materials for the collection of commodity and offer certain margin as dealing charge. The facilitator traders are called commission agents and the ones they facilitate are the local collectors. The immediate destinations of all these agents remained to be Karimganj, Bagha, Hailakandi, and Silchar in Assam State to date.

4) Ginger

There is no organised marketing channel for ginger, which is supposed to be in place because this crop is one of the most important cash crops in the state. Small traders and agents (both local and outside) of trading establishments located in the neighbouring state of Assam would come to the village to collect

this commodity. These marketing agents would, in turn, transport it to the wholesale traders operating in Assam, such as Karimganj, Bagha, and Silchar for further dispatch to terminal markets via Siliguri to Kolkata, Azhadpur (Delhi), Amritsar, and Mumbai and through Karimganj to Bangladesh. The traders and agents would quote any rate and haggle with the farmers who are unaware of what is happening outside the state.

As per the information obtained from the farmers contacted from six villages in the production area during the market survey, the existing marketing channel of ginger can broadly be identified.



Source: Market Survey, JICA Study Team

Figure 4.6.8 Marketing Channels of Ginger

As seen in the Figure 4.6.8, there are three major marketing channels of ginger. channels (2) and (3) assume major importance because the local consumption, which is identified in channel (1), occupies a relatively small amount and is quite negligible.

In channel (2), local traders collect the commodities by putting in place various collection points along the roadside of their respective villages and they normally pay a price lower than the prevailing wholesale prices of the next destination. Once they have collected enough quantity, they move it in bulk to the main collection areas located in Assam and West Bengal, usually Bagha, Silchar, and Siliguri, through their own transportation arrangements. They sell them in bulk to the wholesalers in these areas and earn a certain amount of profit. These actors or local traders serve as an important link between producers and wholesalers in the selling point. However, it is very difficult to trace the movement of these commodities once they passed the main collection points in Assam. As per available information, after reaching the main market terminal in some major cities, the commodity is processed (grading, packaging, cleaning, etc.) and then passed on for sale to either the local or export markets.

Source : JICA Study Team

Photo 4.6.7 Betel nuts

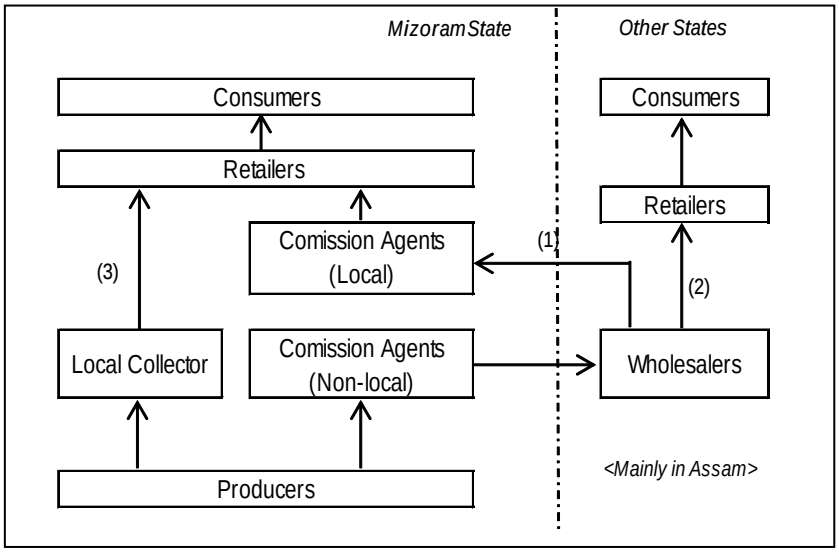
In channel (3), the main actor at the village level appears to be the local (commission) agents and the itinerant agent who hail from both local and other states. The local agents in the village collect the commodity at the prices authorized by the itinerant agents and they would be given a certain fraction as dealing charge. The itinerant agents, on their part, provide the local agents with funds and gunny bags, for collection and packing of the ginger. The same are transported by itinerant agents to the wholesalers trading in the next destination. The wholesalers further move the commodity as same to channel (2).

Information obtained from the six selected villages revealed that more than 69% are farmers and more than 70% of the products were directly sold to local agents. At the same time, products sold to local traders (who are also producers) constituted 28.65% of the total production.

5) Betel nut

Betel nut is extensively cultivated in the western and northwestern parts of the state in Kolasib and Mamit districts. To represent these two districts, two villages, Zamuang and Bilkhawthlir in Mamit and Kolasib districts, respectively, are selected for the market survey.

It was observed that there is an unorganised but systematic flow of betel nut market in these two areas. The buyers are normally commission agents from the state of Assam who purchase the betel nut groves at least two months before actual harvesting. Harvesting and transportation are in the hands of these commission agents. Actually, the producers are only responsible in clearing the plantation field. Based on the information obtained from an interview with knowledgeable persons and leaders of the growers associations, market channels presented in Figure 4.6.9 can be identified for betel nut in Mizoram.



Source: Market Survey, JICA Study Team

Figure 4.6.9 Marketing Channels of Betel nut

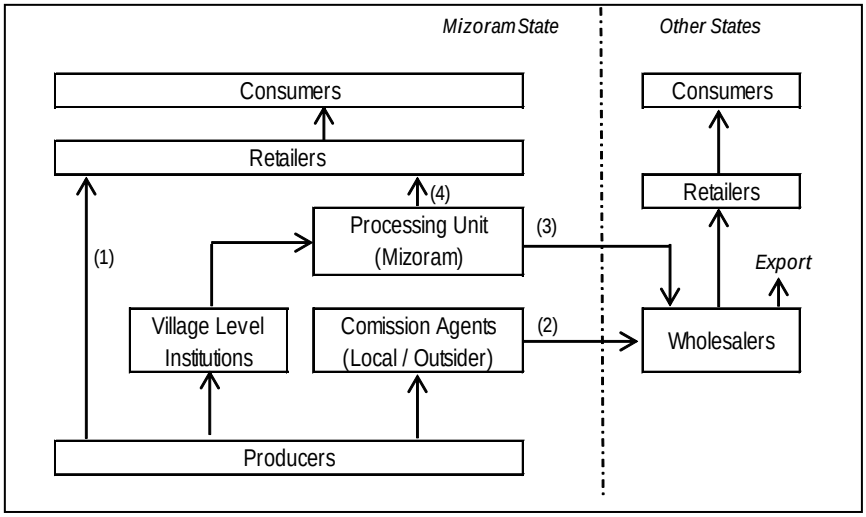
First, non-local commission agents, normally from Assam, arrive at the village during October–November and purchase the betel nut in groves while the nuts are still tender. The price of betel nut is quoted based on the expected number of nuts in each tree. Normally, they pay Rs.110-120 per tree, that usually bears 200-400 nuts. After this process is completed, they go home and come back in the months of January-February for the harvest. They carry them in bulk to the wholesalers operating in Assam. These wholesalers keep the commodity in storage centres (called skops), operated either by themselves or others, for resale and when there is demand from Mizoram and other states of India. As per the information obtained from the interview with betel nut retailers in Aizawl market areas, local commission agents collect the commodity from these wholesale dealers at prevailing wholesale prices and transport them to Mizoram for onward delivery to retailers who then sell it to the consumers.

Channel-(2) follows the same pattern as channel-(1) above except for the agents in the final stage of the market chain. That is, the retailers mentioned in this channel are operating in other states.

Third, the marketing channel of certain quantities of the produce which the producer reserves for sale in local markets and own consumption is presented in channel-(3). If it is meant for sale in bigger market destinations within the state, local commission agents buy the commodities and sell the same to retailers within the state.

Generally, these quantities are marketed at relatively higher price during off-season, i.e., May-July.

6) Broom



Source: Market Survey, JICA Study Team

Figure 4.6.10 Marketing Channels of Broom

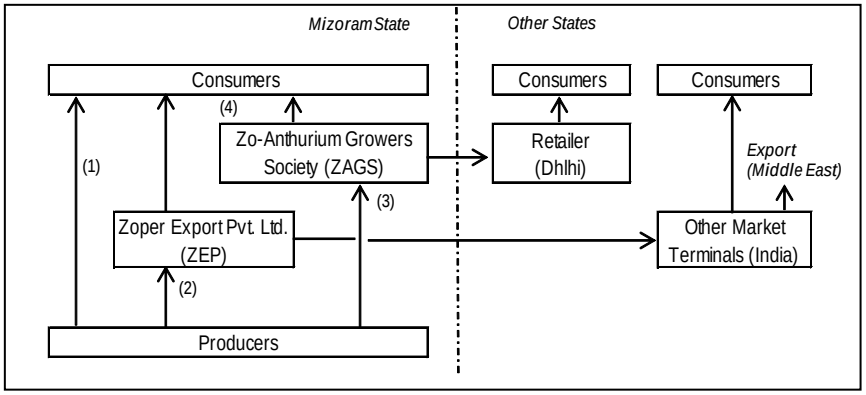
There are two broad marketing channels in the state, viz. traditional marketing channel (like direct sale of the products, selling to commission agents, etc.) and emerging market channels (marketing through organised marketing institutions). Since the farmers themselves can make the final product for this commodity, i.e., broomstick, and can be stored by the farmers without any technical support, it can reach the consumers directly in its final form throughout the year. The main channels of its marketing as observed in the market survey can be summarized in the flow chart shown in Figure 4.6.10.

Marketing channels can be classified into traditional channels (channels-(1) and (2)) and emerging channels (channels (3) and (4)). The first two channels had been in practice for a long time, while the remaining two channels had been instituted only recently with the formation of the facilitator agency in the state. While the emerging channel is running in an organised manner, the traditional channel does not. It should be noted that wild brooms also contribute a significant portion of the market volume in the state. Accordingly, farmers who collect wild brooms from the forest are also considered producers because they are in first contact with the commodity.

First, since broom processing and making of broomstick and other products do not require much technical knowhow, the producers themselves can undertake it and sell them directly to the retailers or consumers. This case is presented in channel-(1). As the producers have longer retaining capacity for raw brooms, this channel has been in place in the state for a very long time. Second, in channel-(2) there are some traders, middlemen (commission agents), who come to the village to collect broom (in its original form) from the producers. This channel is prevalent in the state since the people started marketing brooms. These agents transport the commodity beyond the state, normally to Assam, and sell it to the wholesalers for further processing, to sell the same either to the domestic or export markets. These agents often get the support of local traders in the procurement and transportation of brooms from their respective villages.

Third, the main stakeholder in channels-(3) and (4) is the Hnamchhantu Pawl (HCP), an NGO, and its network across the state. This organisation has branches or sections in different parts of the state. It has opened ten broom collection centres across the state. Their members brought the brooms they had collected from the farmers to these centres, which would later transport them to its headquarters in Aizawl where it will be processed in its final form, i.e., broomsticks and other broom products. After completing the requirements of grading, weighing, binding/wrapping, and packaging at the general workshop of HCP in Aizawl, the products are then sold to agents of wholesalers from outside the state. A major portion of the product is sold outside the state through these agents. It was reported that through this organisation, these agents brought the commodities to big wholesale markets located in Delhi, Mumbai, Rajasthan, and Guwahati. Moreover, wholesalers dealing in Mumbai and Rajasthan export the products to Iran and Afghanistan, in addition to their sale to local dealers, while the remaining centres are selling the products within the country.

7) Anthurium Flower



Source: Market Survey, JICA Study Team

Figure 4.6.11 Marketing Channels of Anthurium

The existing marketing channels are determined by the scope and coverage of the two marketing institutions in the state, viz. Zopar Exports Private Limited (ZEP) and Zo-Anthurium Growers Society (ZAGS). The two differ in scope and coverage. While ZEP can be accessed by producers if they are ready to sign a pre-contract agreement in respect of procurement prices and terms of marketing, the scope of the ZAGS is restricted to members only. That is, members of ZAGS can market their commodities through either of the two, but non-members can sell their produce only through ZEP or direct sale to retailers/consumers. Considering all these aspects, the market channels shown in Figure 4.6.11 can be identified for anthurium flowers in Mizoram.

First, since all flowers brought by the growers to each of these agencies (ZEP and ZAGS) are not fit for export outside the state, the rejected cut flowers are disposed off by the growers themselves in whatever way they can. At the same time, these growers also sell flowers directly to local consumers. This is presented in channel-(1). Second, the cases of flowers sold by the producers to ZEP, who processed it by grading, packing, and weighing for onward export to big market terminals in other states, is given in channel-(2). As mentioned earlier, these marketing agents would sell the commodity to domestic and export markets. Third, channel-(3) is mentioned as the members of ZAGS selling the flowers to its main office for onward export to Delhi, after packing, grading, and weighing. The agent in Delhi would sell them in domestic markets. Lastly, the offices of ZEP and ZAGS are also operating as flower showrooms. Cut flowers sold by these agencies directly to local consumers are shown in channel-(4).

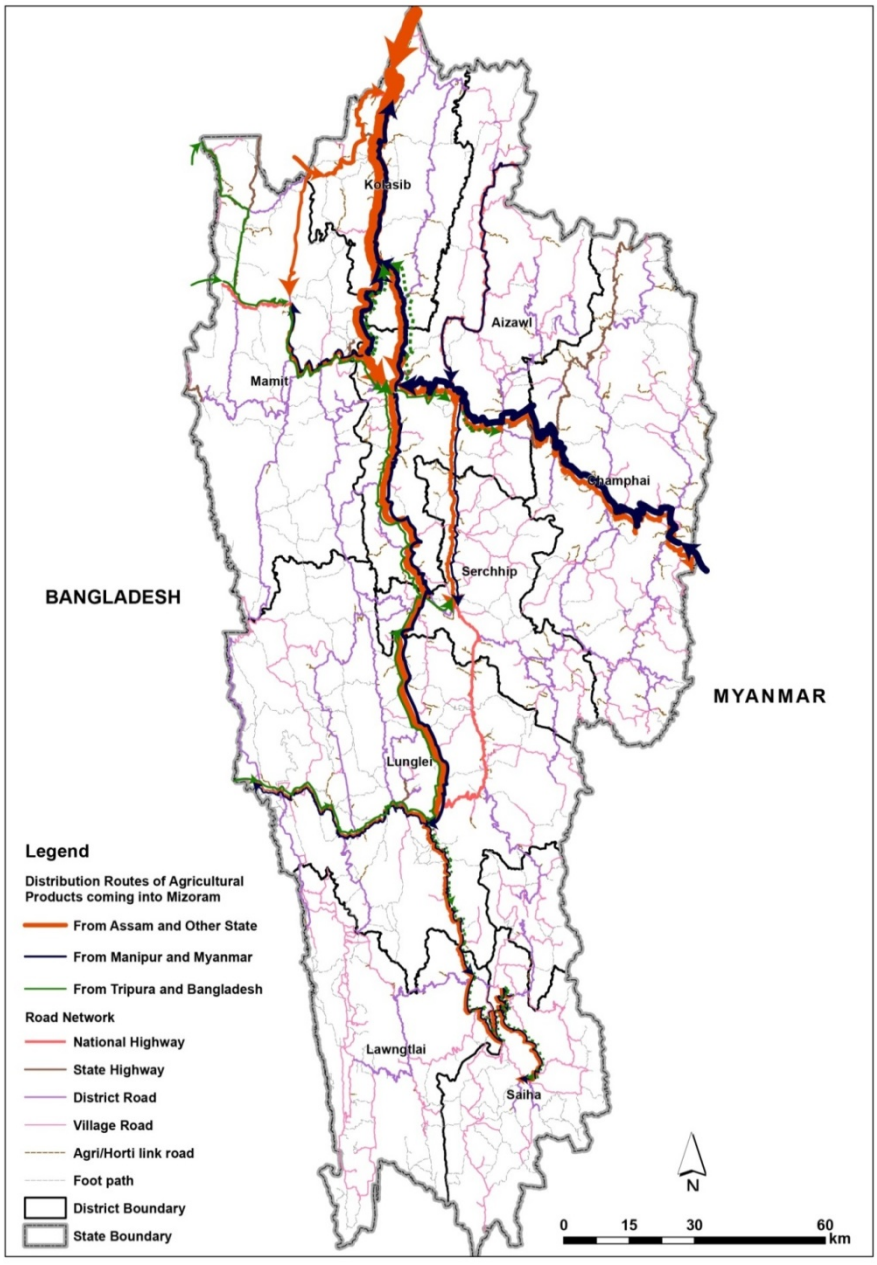
(7) Distribution of Products Coming into Mizoram

Agricultural products sold in the state have been depending heavily on outside sources and such imported products are dominating the local market. The agricultural products produced in other states and countries such as potatoes, onions, garlic, rice, and eggs are mainly transported in Mizoram through the border gate in Vairengte, sharing about 80% among all four gates to other states. The wholesalers/brokers in big cities centred in Silchar send the products to wholesalers in Aizawl. They transport and sell them to market retailers and grocery shops in Aizawl as well as in the villages and towns of the regional area. On the other hand, agents from Assam State mainly Silchar come around the regional area and sell them to grocery shops directly. Unlike other local commodities sold in the markets, such products are mainly sold in grocery shops in towns and villages. Additionally, local collectors and brokers distribute some agricultural products from Myanmar such as garlic and Chinese apple from Zokhawthar to Aizawl via Champhai. Those products are sold in the markets and grocery shops along the road from Zokhawthar, competing with local products and products coming from Assam State. In the survey period in November, mostly Myanmar products had vanished in the markets close to

Source : JICA Study Team

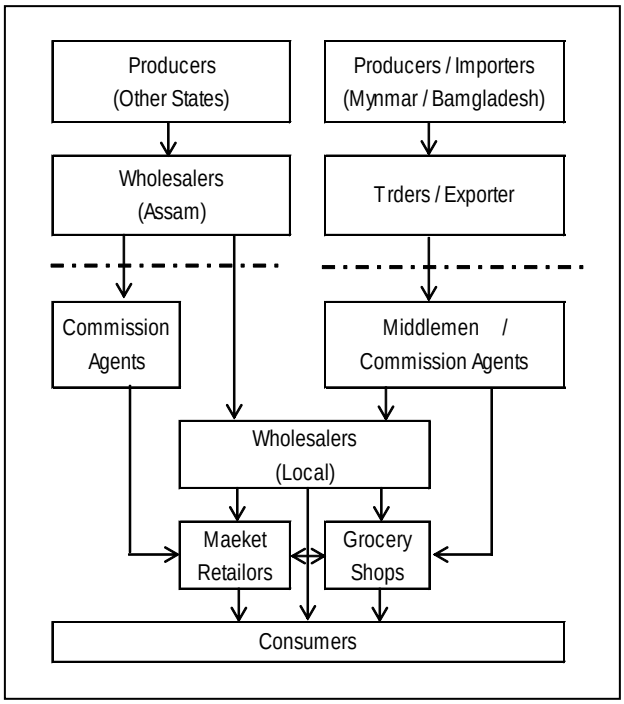
Photo 4.6.8 Imported Products Sold at a Grocery Shop

Aizawl but garlic is distributed to Aizawl markets and further to Kolasib, sold together with one from Assam State. Similar to the above, the study team can broadly classify the commodities into two – imported from an Indian state (including local source) and those imported from other states and neighbouring countries. Potato and turmeric belong to the former, while onion and garlic to the latter. Wholesalers or wholesale dealers were found to occupy a prominent place in the marketing of these commodities. The existing market channels for these commodities are presented in Figure 4.6.13, and general distribution routes are illustrated on the state map in Figure 4.6.12.



Source: JICA Study Team

Figure 4.6.12 Distribution Routes of Incoming Products to Mizoram



Source: Market Survey, JICA Study Team

Figure 4.6.13 General Distribution Channels of Products Coming into Mizoram

(a) Findings of the Market Survey

1) Fish

There are two main sources of fish sold in Mizoram – local and imported. Normally, the local fish is harvested during the dry season of the year starting from November which lasts until March. Local fish products are marketed through two main channels: export to Assam and sell to local market. At the time of harvesting, individuals from Assam would come to the village and collect all the bigger-sized fishes from the producers at quoted (and bargained) prices of the fishermen. The fishes are usually priced according to their size and not on weight. The agents would then transport the procured fishes to market areas in Assam and sell them singly to the highest bidder. It was reported that fishes bought from Mizoram are in high demand in these areas.

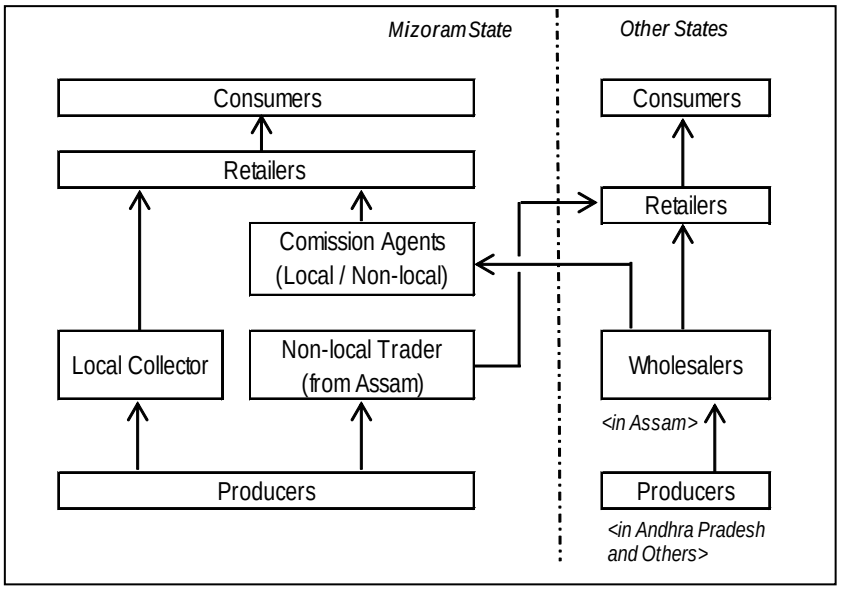
The remaining smaller-sized fishes are being sold to the local collectors who transport it to towns and cities for retail sales. Since there is no available cold storage van to transport the fishes to other locations, these agents are obliged to buy ice blocks from ice plants operated by the government to keep the fishes from being spoiled. There are also some instances in which the producers themselves sell their produce directly to the consumers at different urban areas of the state. Figure 4.6.14 presents the usual channels of the fish market in Mizoram.

Imported Fishes Sold
in New Market, Aizawl

Local Fishes Sold in Serchip Market

Source:JICA Study Team

Photo 4.6.9 Fish Retailing



Source : JICA Study Team

Figure 4.6.14 Marketing Channels of Fish

Because the supply of local fish in the market is in periodic intervals, i.e., especially during winter season, local demand has to be catered by import from other states. As per the record of the agents contacted during the market survey, substantial quantity of the state's import of fish originates from the state of Andhra Pradesh (AP). It was reported that wholesalers dealing in the Silchar area of Assam purchase the commodity from AP and deliver it to the local or non-local commission agents operating in the state for onward sale to retail dealers. Due to lack of proper storage facilities in the state, these wholesale dealers would deliver only the quantity ordered by the commission agents. This quantity demanded by the commission agents is determined by their anticipation of market demand in Mizoram.

2) Potatoes

The major sources of potatoes are the states of Meghalaya and West Bengal. Imports from Meghalaya usually start from August until the end of December; while imports from the latter starts from January and lasts until August. It is safe to say that almost all the potato produce sold and bought in the market are from other states. It was reported that there are two stages of wholesale dealings before reaching the retailers. The products, whether from Meghalaya or West Bengal, is firstly obtained by wholesalers operating in Assam and these agents would deliver the commodity to local wholesale agents. The local wholesale agents place the quantity ordered to these wholesalers, and the latter would supply the same to the former. Further, local wholesalers are also found to be selling potatoes directly to consumers at prevailing retail prices, in addition to their wholesale price to retailers.

3) Onion and Garlic

Roughly more than 70% of onion sold in the local market is contributed by imports from other states of India through wholesalers dealing in and around Silchar, Assam. The state also depends on the import from the neighbouring country of Myanmar as and when there is insufficient supply from other states. At the same time, the demand for Myanmar-produced garlic is comparatively high because its cloves are bigger compared to the nation's produce. As such, garlic imported from Myanmar occupies more than half of the product sold in the local market, which is followed by import from other states and Bangladesh (Chinese garlic). Mostly, imported items are obtained by the wholesalers through some middlemen (or commission agents) operating along the international border of Myanmar (Zokhawthar, Champhai) and Bangladesh (Tlabung, Lunglei District).

Source: JICA Study Team

Photo 4.6.10 Chinese Garlic Imported From Bangladesh (Tlabung)

4) Turmeric Powder

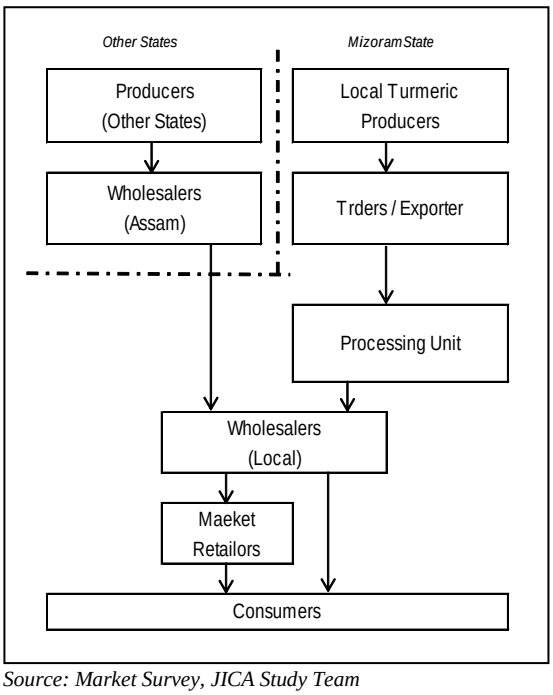
There are two major sources of turmeric powder marketed in the local market, namely, local products and imports from other states. It may be noted that extensive cultivation of turmeric in the state had started from the last few years. To facilitate its cultivators, the state government set up a turmeric processing plant to be run by the growers' society at Reiek to cater to the needs of turmeric growers in this cluster. This is called in the channels as local processing plant and the product of this plant has been sold in the local markets. At the same time, turmeric powder imported from other states still occupies a major portion of the product being marketed in the state.

Source: JICA Study Team

Photo 4.6.11 Various Turmeric Powder Sold at Serchip Market

Major agricultural products distributed into Mizoram State are listed in Table 4.6.10.

Other than major agricultural products listed in Table 4.6.10, many products such as carrot, radish, eggplant, watermelon, and various leafy vegetables coming from Assam State, Chin State of Myanmar, and Bangladesh are sold like local products in the markets close to the border gate. Some products, not all, distributed further to other area exist seasonally.



Source: Market Survey, JICA Study Team

Figure 4.6.15 Marketing Channels of Turmeric Powder

Table 4.6.10 Major Agricultural Product Coming into Mizoram

Product	From
Potato	Megalaya/West Bengal (Jan. – Mar.)
Onion	Assam/Myanmar
Tomato	Megalaya/Myanmar
Garlic	Assam/Myanmar/ Bangladesh
Cauliflower	Megalaya/Myanmar
Cabbage	Assam
Apple	China (via Vairengte/Zokhawthar)
Rice	Megalaya/Manipur/other states
Egg	Assam
Fish	Andra Pradesh

Source: JICA Study Team

(8) Distribution of Other Specific Products

(a) Rubber, Coffee, and Palm Oil

Rubber, coffee, and palm oil cultivation are promoted by the Soil and Water Conservation Department under the NLUP Scheme. Palm oil cultivation is promoted by the Agricultural Department. The products are sold to special enterprises as the coffee board, rubber board, and palm oil processing companies, respectively, through contracted cultivation and have no serious problems in marketing.

Table 4.6.11 Sales Condition of Rubber, Coffee, and Palm Oil

Products	Sales and Distribution Condition	Note
Rubber	・ Farmers grow and maintain rubber trees and receive a management charge of Rs.250/tree from the Rubber Board. Processing and marketing after tapping are done by the board. ・ Recently, the Soil and Water Conservation Department trained farmers and promoted the processing of dehydration and drying after collection of latex. If farmers will process and sale latex sheet their sales will increase to Rs.500/tree.	It takes about seven years after planting before the latex is collected.
Coffee	・ After pulping dried beans are sold to the Coffee Board of the Ministry of Commerce and Industry. ・ Beans are classified into four grades by width and packed in gunny bags at the stations of the Coffee Board*. ・ Coffee bags are sold at the auction market in Bangalore. ・ Farmers receive advance payment upon shipping and balance payment are done after sales at the auction market.	*Located in Kolasib and Lungley. As market price of coffee fluctuates, time of sales at the auction market maybe delayed to maximum of one year after purchase. Sales price fluctuates between Rs.50/kg and RS.150/kg in the last three years (some producers in Kolasib). It takes three years to harvest beans after planting.
Oil Palm	Palm oil processing companies (private oil mills) purchase palm fruits.	It takes three years to harvest fruits after planting. However, harvesting is delayed from four to five years by luck upon fertilizer and chemicals adaptation.

Source: JICA Study Team

(9) Value Chain Analysis of Selected Commodities

Value chain estimation was carried out on selected commodities together with clarification of distribution channels and stakeholders through the market survey.

The remarkable outputs of the analysis are summarized as follows:

- All the information analysed in the market survey revealed lack of basic marketing infrastructure and institutions to facilitate marketing of agricultural produce in Mizoram. The advantages of well-organised marketing institutions and channels have indicated a result of higher producer's share in the final price, while the inverse is the case of an unorganised market channels. Examples are the cases of the broom and betel nut. The former is marketed through a well-organised marketing channel (i.e., Hnamchhantu Pawl <HCP>) while the latter is characterised by non-transparent and unorganised channel. The advantage of an organised market channel is relatively higher producer's share in the final price, earnings, and generation of employment opportunities in the process of value addition by various stakeholders. At the same time, marketing of betel nut shows unnecessary transit via Assam on the account of intermediary intervention in its process resulting in low producer's share in the final price with the consumers being the loser.
- In spite of being grown largely across the state, ginger market is still characterised as unorganised and non-transparent channels. Prices remain uncertain and the producers have to take the risk of growing it.
- For the staple food items of the people, there is no regulated market mechanism for these commodities to check price increase and to facilitate regular flow of supply. The producers as well as consumers are exposed to the market controlled by a network of intermediaries, which results in high prices of commodities with uncertainty on quality delivery and unremunerative price earned by the producers.
- There is no organised marketing institution from either the private or public sectors to facilitate marketing of agricultural products in general. The study found good scope for the introduction of modern marketing chains of vegetables and fruits in the state. This would include contract farming, emergence of facilitative NGOs, self help groups (SHGs), private investment, etc.

(10) Market Information

The Department of Economic and Statistics (DoES) collects data for both wholesale and retail prices of various commodities. Retail prices of 101 food items and 71 non-food items are collected on a busy day,

Friday or Saturday, once a month from 16 urban markets of Mizoram, i.e., four markets in Aizawl Town and two markets each in six districts. As there is no urban area in Laungtlay District,this is not collected. In addition, wholesale price of 20 food items are collected from eight district capitals quarterly.

The program for calculating wholesale price index (WPI), retail price index (RPI), and consumer price index (CPI) managed by the Central Statistical Organisation (CSO) assigned such role to DoES. Moreover, the collection of market price in "rural areas" is assigned to the post office but has not started.

The collected data is sent to CSO in Delhi, and then accumulated and processed to the data of "price, price index, and minimum wages" of the quarterly bulletin. This bulletin is published by DoES, distributed only to all departments of the state and not used publicly.

On the other hand, TCD also collects market price of 99 agricultural commodities in major markets weekly together with trade volumes through the district offices. The data is not digital and data sheets are kept in filing holders in the head office after sending a copy to the Directorate of Marketing and Inspection (DMI), Ministry of Agriculture, where the data is processed and loaded up to the market information portal website in India named "Agrimarknet".

In the same manner, the data of commodities and volume passing through the check gates of the state border are collected and recorded by the check gate offices and sent to the head office. The data sheets are only kept in filing holders and are not processed in a computer.

Therefore, the annual total volume by categories and major commodities that passes through check gates are summed up manually by a staff of the department referring to the records kept. The result is shown in Table 4.6.12

Table 4.6.12 Major Agricultural Products Coming in and Going out of the State

No.	Item <Coming in>	Unit	2011–12			2012-13		
			Quantity	Rs./Unit	Amount (Rs.)	Quantity	Rs./Unit	Amount (Rs.)
1	Vegetables	Qtls.	39,247	3,500	137,364,500	60,807	4,000	243,228,000
2	Potato	Qtls.	59,632	2,500	149,092,500	74,400	5,000	372,000,000
3	Onion	Qtls.	23,372	3,500	81,802,000	47,050	7,000	329,350,000
4	Pineapple	Qtls.	1,877	3,200	6,006,400	9,174	3,600	33,026,400
5	Cattle	No.	1,300	25,000	32,500,000	1,337	32,000	42,784,000
6	Pig	No.	420	20,000	8,400,000	240	27,000	6,480,000
7	Goat	No.	2,137	3,000	6,411,000	4,913	3,300	16,212,900
8	Poultry	Tukrie**	14,271	5,500	78,490,500	2,623	6,200	16,262,600
9	Egg	Box	87,138	1,050	91,494,900	85,370	1,155	98,602,350
10	Fish	Box***	33,091	6,000	198,546,000	48,157	7,200	346,730,400
11	Betel leaves	Tukrie	29,639	4,500	133,375,500	47,596	5,500	261,778,000
12	Betel nuts	Qtls.	43,610	2,500	109,025,000	39,608	3,500	138,628,000
13	Rice	Qtls.				15,322	1,600	24,515,200
	Total				1,032,508,300			11,919,597,850
No.	**Item <Going out>**	**Unit**	**Quantity**	**Rs./Unit**	**Amount (Rs.)**	**Quantity**	**Rs./Unit**	**Amount (Rs.)**
1	Squash	Qtls.	12,874	800	10,299,200	29,063	1,000	29,063,000
2	Hatkora	Qtls.	9,676	2,000	19,352,000	43,313	3,000	43,313,000
3	Orange	Qtls.	6,469	3,000	19,407,000	7,689	7,000	53,823,000
	Total				49,058,200			126,199,000
No.	**Item* <Going out>**	**Unit**	**2011**			**2012**		
			Q'ty	**Wholesale Rate Rs./kg**	**Amount (Rs.) By Avg. Rate**	**Quantity**	**Wholesale Rate Rs./kg**	**Amount (Rs.) By Avg. Rate**
1	Ginger	Qtls.	184,045	25–35	552,135,000	90,721	15–18	149,689,650
2	Turmeric	Qtls.	78,790	8–10	70,911,000	67,870	8–10	61,083,000
3	Chilli	Qtls.	18,970	80–150	218,155,000	12,475	80–150	143,462,500
4	Sesame	Qtls.	5,440	40-60	27,200,000	3,547	40-60	17,735,000

	Total			868.401,000			371,970,150

*Source: TCD (*MAMCO) Note: ** 34 kg, ***40 kg*

Among the commodities coming in to Mizoram, the amounts of potato, fish, onion, and betel nuts/leaves exceeded more than Rs.100 million each and shared Rs.1,450 in total.

(11) Monthly Market Prices

As mentioned above, collection of market prices information is done by TCD and DoES. But TCD does not collect it by permanent rotation as daily or monthly, and DoES only collects it every month in 16 markets of seven major towns as shown in Table 4.6.13

Table 4.6.13 Price Information Collection in Markets

No.	Town	Market Name	Survey Week	No.	Town	Market Name	Survey Week
1	Aizawl	Bara Bazar	1st	9	Champhai	Vengsang	2nd
2	Aizawl	Thakthing	2nd	10	Champhai	Vengthlang	4th
3	Aizawl	Bawngkawn	3rd	11	Serchip	Bazar Veng	1st
4	Aizawl	Vaivakawn	4th	12	Serchip	New Serchip	2nd
5	Mamit	Mamit Bazar	2nd	13	Lunglei	Bazar Veng	1st
6	Mamit	Field Veng	4th	14	Lunglei	Chanmari	2nd
7	Kolasib	Diakkawn	1st	15	Saiha	Saiha Bazar	2nd
8	Kolasib	Bangla Veng	2nd	16	Saiha	New Saiha	4th

Source: DoES

The data of the major 8 importing products and other 17 products selected from the monthly market price information by products collected by DoES were compiled and the monthly price trend of each product was analysed. From the analysis result, the characteristics on distribution of agricultural products at selected seven major town markets in the state are found and summarized in Table 4.6.14.

Table 4.6.14 Characteristics of Major Town Markets on Agricultural Products Distribution

Town Market	Characteristics
Aizawl	For many local products such as green chili, bitter gourd, cucumber, banana, and even imported products, Aizawl Market has the role of the central wholesale market to other markets in the state.
Champhai	Chanmphai Market shows that the characteristics of price behaviour are due to supply conditions of local products in the surrounding area and of imported products from Myanmar. The market shows usually high prices for products coming from Assam.
Kolasib	Location of Kolasib is at the gate to Assam State, and market price indicates the lowest price for import products from Assam. In contrast, the market price shows high for some local products as well as products imported from Myanmar via Champhai.
Lunglei	Market price in Lunglei shows strange behaviour for some products that are usually high such as apples, soybeans, and bananas. It might be due to unstable condition between supply and demand as the intermediate location to the south and west areas of the state along the national and state roads.
Serchip	Serchip is located a little south from Aizawl, but the market price does not show correlation to Aizawl for some products. Serchip has another distribution route via Seling to the main route of Aizawl to Lunglei. Some products coming in from Assam probably arrive directly to Serchip Market from Vairengte, a gate to Assam, without going through Aizawl, which is similar to the imported Myanmar products from Champhai.
Saiha	Saiha Market shows similar trend in market price as of Champhai. The market price shows high price trend for imported products from Assam and Myanmar due to the long distance from importing gates. Market price behaviour characteristic is due to supply conditions of local products in the surrounding area.
Mamit	Even though Mamit District faces Assam, the market price does not show any advantage, i.e., lower price for products coming in from Assam. It seems that most products are distributed from Aizawl by demand and market price is relatively high with more fluctuations than other market in general.

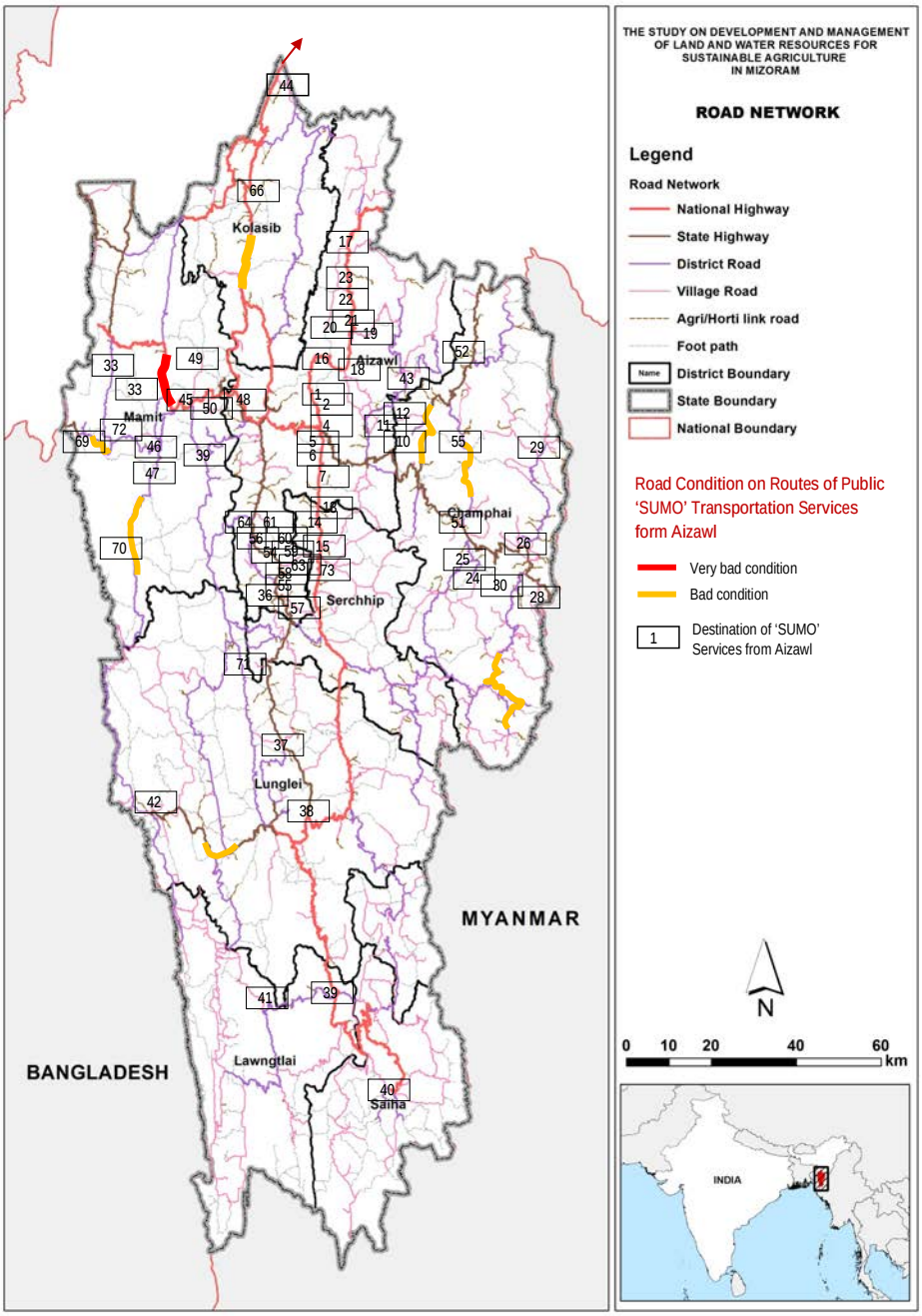
Source: JICA Study Team

(12) Road Condition

National, state, and district road conditions in the state are generally bad, as many sections exist on single- and two-lane roads. Paved roads are limited due to inadequate road design and insufficient maintenance works. As a result, it takes longer time for driving and causes damage to transported commodities. It is noted that the state road between Aizawl and Lunglei was recently improved through World Bank's assistance and is considerably in good condition.

The JICA Study Team carried out the interview survey with staff and drivers of private small bus enterprises (Sumo) and with passengers in Aizawl regarding the service routes starting from Aizawl, as well as fare and road conditions of each route. Figure 4.6.16 shows all the destination places of routes and inferior sections of the roads.

- Small bus service covers 74 destination places from 50 km distance of Sairang to 700 km of Saiha in the state. Bus services operate throughout the year but sometimes cannot due to landslides during rainy season.
- They also cover the routes going to big cities out of the state such as Bagha, Guwahati, Silchar, Shillong, Churachanpur, and Imphal via Vairengte.
- The road sections with bad condition are indicated on the map by a yellow line as shown in Figure 4.6.16 and the section with red line on route to Mamit is the worst.



Source :JICA Study Team

Figure 4.6.16 Destination and Road Condition on Routes of Public 'Sumo' Transportation Services

4.6.3 Constraints for Development in Agro-processing and Marketing Field

Constraints extracted and analyzed from the result of the survey indicated the relational diagram in Figure 4.6.17. Based on the diagram, subjects that must be overcome for the agricultural sector development are summarized below.

(1) Private Sector

(a) Lack of Basic Knowledge on Business Management

Human resources, regardless whether farmers, agro-processing industry managers, and market retailers, who can manage their business with basic knowledge on business management, are very limited. As a result, the following examples can be ascertained:

- When asked about break-even cost when a farmer could not sell his product well and less profit due to the competition with products coming from other states, the farmer could not provide a numerical value. Due to this, he cannot accomplish a strategy.
- Facilities such as warehouses, roadside shops, and post-harvest processing machines were provided under the support programs, but most of them have not been managed well and were not used effectively. Thus, recipients have difficulty reaching a stable business condition even after receiving all inputs of facilities, equipment, and funds for starting their business through the official assistance programs.
- Most retailers in the market, recognized as members of associations but individual business managers, cannot provide an answer to the question about business vision.
- Most farmers and stakeholders do not know the real value and meaning of post-harvest processing including grading, packaging, and storage and do not have a motivation for improvement.
- The state has to rely on the import of vegetables, which it produces in large quantity, from other states and Myanmar because of inadequate arrangements that could ensure uninterrupted flow of supply.

(b) Consolidated Pricing Mechanism in the Market

Through distribution channels of most agricultural products, mainly products coming in and going out from the state, associations are organised in each stage of collectors, middlemen, wholesalers, and retailers in order to determine and fix the prices of each product. For example, retailers in a market shall not buy high priced products and sell them at a price lower than the fixed price set by the association. This situation means that only one retailer exists in a market. The producers and consumers cannot have the option to negotiate price.

Similar to it, free market has not existed in Mizoram State where participants can negotiate with each other under a free and fair condition. Such consolidated condition along with the distribution channels of products is originally managed by traders of the Assam centred Silchar.

It is pointed out that such association activities are not allowed, as it prevents a free and fair competition in developed countries including Japan, and are eliminated and punished by the supervisory authority. There are similar regulations and a supervisory authority in India but the effect has not reached the markets in Mizoram yet.

(c) Less Number of Independent Local Wholesalers

The number of wholesalers who trade products by their own network of purchase and sales other than wholesalers, who at the same time receive products from Assam traders and distribute them to local markets are very limited. Subsequently, some products such as betel nuts and oranges are once purchased and transported to Assam by Assam traders and re-enter to Mizoram State and sold in local markets.

- Establishment of storage facilities and processing plants, like the ones operated by traders in Assam, should be the area of interest to avoid unnecessary transit of betel nuts via Assam and frequent interface of the farmers with non-local commission agents. Any initiative to this end is expected to facilitate the emergence of a more organised betel nuts marketing channel and would boost the morale of producers to produce more.

However, some new marketing system has appeared in the agro-processing field in the state where agro-processors purchase local products such as ginger, broom, and anthurium flower and sell their products through their own distribution channels.

(2) Official Sector

(a) Insufficient Components and Procedure of Support Programs

Various official support programs provide equipment, facilities, and funds for activities in a wide area from production to processing. However, most programs cannot show the expected results.

- In the promotion program of tung cultivation, farmers are facing difficulties in looking out for buyers who are after the production of oil.
- As mentioned before, facilities such as warehouses, roadside shops, and post-harvest processing machines are provided under the support programs, but most have not been used effectively.
- The NLUP program implemented by ID that provides all inputs to persons who like to start a business also faces the same results.

Lack of basic knowledge on business management among farmers and processing business managers is a crucial constraint and most of them cannot have adequate business mind. Under the situation, the recipients of the support program who can manage and use the inputs well and make their business to be in sustainable condition are very limited, even if the support program provides equipment, facilities, and funds (hardware). The program does not provide the training component and software by which recipients can use their inputs properly and manage their business to reach a self-reliant condition.

Additionally, in case of a promotion program for newly introduced crops, marketability of products, and feasibility of business in place of farmers would be studied before implementation of the program. However, such study might not be carried out by judging the practical results such as the tung promotion program. The officers in charge of planning the programs may not know the importance of such procedure preparation of the program.

(b) Constraints of Program Planning and Implementation by Departments and Agencies

As business management covers a series of activities from production to sales for farmers, consequently, synchronized provision of support programs along their activities is desirable. Additionally, it is often said that what causes farmers not to increase their sales or profit is marketing problem. However, marketing is one of the components, same as production, which is considered in business management, and they are closely related to each other for farmers. Therefore, it is necessary for farmers and agro-processing enterprise managers to understand that any subject and component of business management is related to all activities of the business.

On the other hand, support programs are planned and implemented by each department and agency due to government institutional mandates. Their support component and implementation could not meet and fit well the recipient needs described above and produce so much waste by overlapping components and sites sometimes. These samples are displayed along the main roads. Similar facilities has been constructed beside roads by various departments and programs, and they are named as “shed”, “shop”, “*haat*”, “market”, and even “bus waiting shed”. And most of them seem not to be used efficiently.

Source: JICA Study Team

Photo 4.6.12 Facilities constructed by three different organisations separately within the same year (near Lunglei)

(c) No Extension System of Market Information

Nowadays, market information is one of the most important inputs for business management lead by “market orientation”, which is like the blood in a body (business). Various strategies could be considered and decided by it.

TCD is the responsible organisation that collects information on arrival and price by agricultural product in major markets and quantity of products that pass by the check gates of the border. However, awareness of the officers-in-charge of handling such information is very low with regard to its

importance, and collected information is not uniformed and barely reliable because they are only kept in file holders in the office without processing for digital data. There is no extension system so that such collected information will not be disseminated and used publicly in the state.

Serious attention of the state government is encouraged to ensure regular dissemination of market (price) information among the producers and other stakeholders, to chalk out avenues for value addition, and to create pleasant environment in order to attract private investment in the processing and marketing of local products.

(d) Difficult Accessibility to Adequate Loan Program

According to the general theory, direct intervention on the grant support shall be avoided as much as possible in maintaining healthy market condition. Therefore, it is desirable for the development of economic sector in the state that micro, small and medium enterprises (MSMEs) including farmers can access whichever appropriate loan program for revolving or investment fund. However, it is difficult to access the loan program suited to borrower's condition like repayment period and condition, interest rate, and guarantee, and borrower's qualification that banks check and screen is high.

Any market intervention scheme put in place by the state government for ginger in the past was found ineffective and had adverse impact upon the procurement prices that prevailed in the open market. Considering these experiences, one can conclude that any attempt by the state government that directly interfere in the markets is bound to fail.

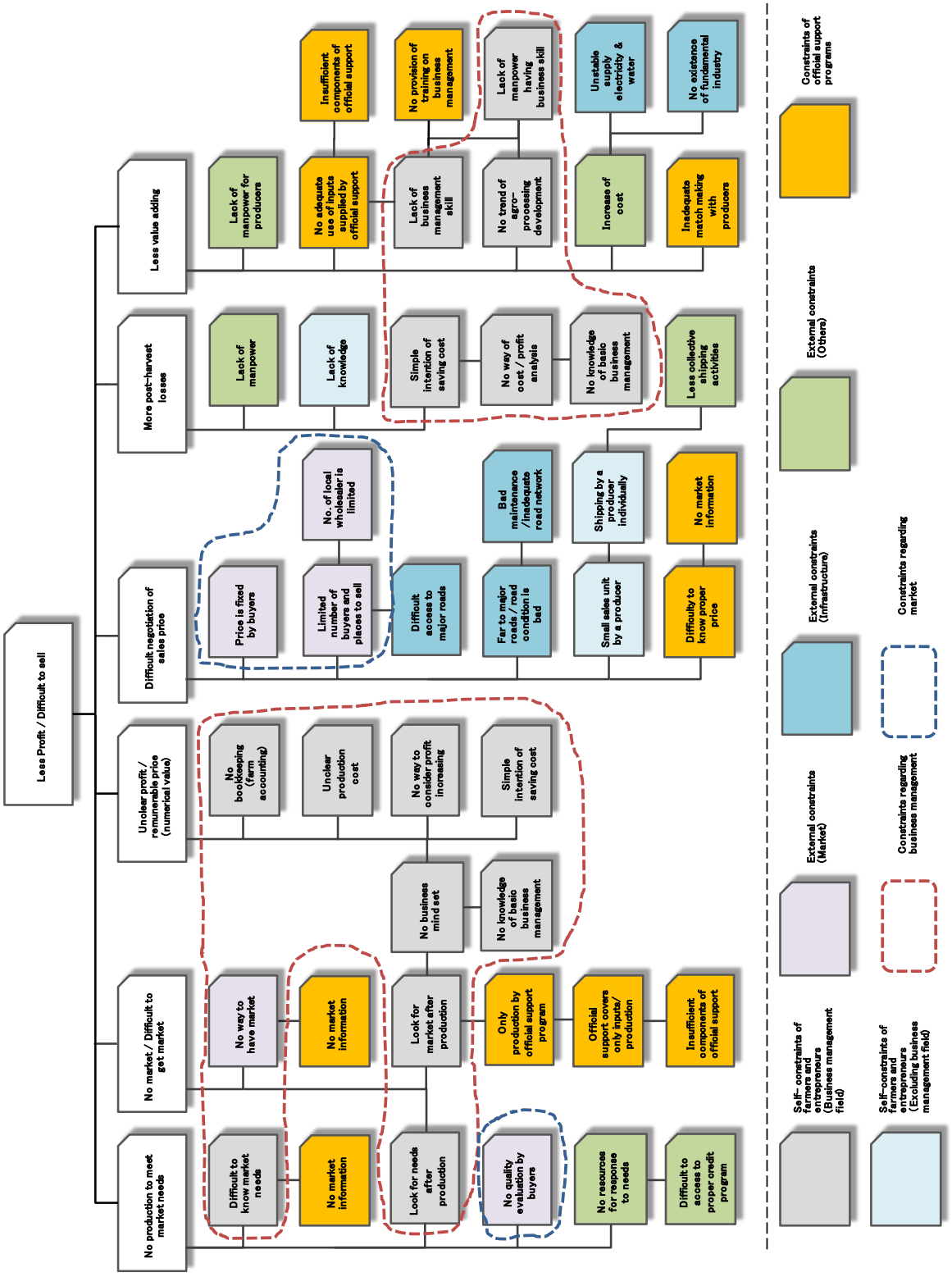
It is a very efficient and essential support program to MSMEs if the circumstance, where anyone could access to the lone suitable condition to one's needs at any time, could be established. For that circumstance, condition of loan shall be diversified to meet borrowers' condition and requirements in details like those of interest may be subsidized and the agency which guarantees the trust of borrowers having no mortgage. Such circumstance has not been established yet.

(e) Inadequate Economic Infrastructure

The existing road network still remains the same, where farmers have difficulty in transporting their products to markets. Even for existing main roads, the surface condition is not good in general and some parts are in serious condition for smooth traffic driving due to insufficient maintenance system. It causes the increase of transportation cost.

Stable supply of electricity and water is also an inevitable requirement for development of industry including agro-processing. However, the public water supply system and electric power supply are both unstable and frequently interrupted. Some owners of agro-processing factories said that the average electricity supply is only about 50% of the operational eight hours a day during the dry season. Under such circumstance, it is impossible to call and promote investments from outside of the state.

Additionally, since there is no fundamental industry that supplies raw materials and inputs to various industries such as simple machines and package materials used by the agro-processing industry, such inputs are purchased outside of the state, thus increase their production cost.



Source: JICA Study Team

Figure 4.6.17 Relational Diagram of Constraints in Agro-processing and Marketing

4.7 Inland Fishery

The Mizoram State is said to have a potential pond area of 24,000 ha for fish farming. In addition, the state has a riverine area of approximately 6,000 ha or 1,100 km and reservoir area of about 4,300 ha. Despite a fairly developed freshwater aquaculture (fish farming) in other states of India, Mizoram is lacking behind due to several issues and constraints related to institutions, manpower, and technology. Aquaculture is a good entry point for diversification of income generating activities; it promotes a better utilisation of available land and water; and it also stabilises the livelihood of the poor and improves their nutritional status. In addition, aquaculture is necessary to supplement the capture fisheries, that is, fishing in rivers, streams, reservoirs, dams, closed water bodies, etc.

4.7.1 Policy, Organisation, and Plan

(1) National Level

The Department of Animal Husbandry Dairying and Fisheries (DADF) of the Ministry of Agriculture is the responsible body for all matters pertaining to fishing and fisheries, inland and marine. The main thrust area in the fish sector is the expansion of aquaculture in fresh and brackish water, and welfare of fisher-folk. In entire India, about 2.41 million ha of water bodies are available for freshwater aquaculture. The DADF anticipates that productivity would be increased to 5 tonnes/ha/year from the present level of about 2.2 tonnes/ha/year with better inputs in terms of seeds, feeds, and fertilizers. The DADF is assisting, through the National Fisheries Development Board (NFDB), both financially and technically, the state governments in promoting intensive aquaculture in ponds. NFDB's assistance is composed of 16 components including construction and renovation of ponds and tanks, supply of first year inputs, construction and renovation of seed hatcheries and rearing farms, establishment of running water fish and trout raising, establishment of fish feed mills, and provision of training and demonstration.

(2) State Level

The responsible agency for the fisheries sector in Mizoram is the Department of Fisheries (DOF), which became a full-fledged department from the Agriculture Department in July 1993. It has the primary responsibility for fisheries administration, management and provision of professional services to ensure sustainable fisheries utilisation and enhanced aquaculture production at the state and district levels. Hence, it has a leading role in aquaculture development, fingerling procurement and distribution, training through demonstration in the state, and focuses its work on pond, open waters (rivers, reservoir) fisheries.

The organisational set up of DOF is shown in Figure 4.7.1. The department is headed by the Director and has about 150 staff both at the state level (Aizawl) and in the field (eight districts) at the district level. The educational levels of the technical staff of DOF from the level of fisheries demonstrator to the director are as follows: two staff with master's degree, 15 staff with university or college degrees, and 46 are high school graduates.

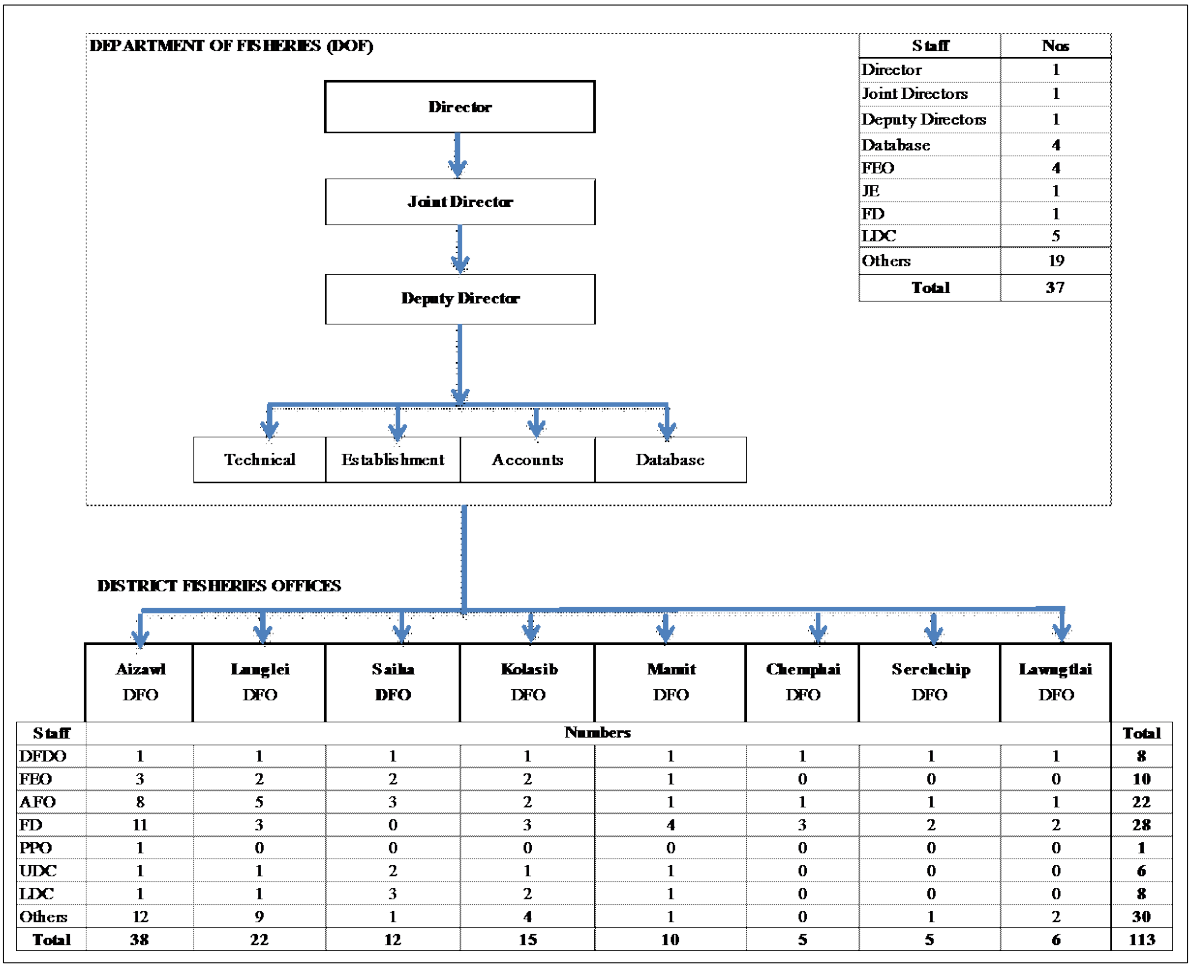
The DOF engages, among others, in activities under the following schemes:

- Demonstration: Under revenue or development budget and schemes, it operates demonstration farms to provide technical know-how trainings and advices to fish farmers on aquaculture and management;
- Fish seed distribution: Both from the development budget and schemes, it procures and distributes fish seeds (fry[1] and fingerlings[2]) to fish farmers, including the fish seeds produced in DOF-owned fish seed farms; and
- Release of fingerlings in reservoirs and dams.

The DOF has eight district-level fisheries offices (DFOs) that are headed by the District Fisheries Development Officers (DFDOs). The duties of DFDOs are summarised below.

[1] Fry: Young fish measuring approximately 2.0-2.5 cm in total length. Sometimes split into early and late or advanced fry stages, merging into early fingerling stage.
[2] Fingerling: Young fish measuring approximately 2.5-13 cm in total length. Sometimes split into early and late or advanced fingerling stages.

- Execute the orders and responsibilities directed from the department of fisheries (Director);
- Assist in the procurement and distribution of fish seeds to fish farmers; and
- Assist fish farmers by providing technical assistance.



Staff	Nos
Director	1
Joint Directors	1
Deputy Directors	1
Database	4
FEO	4
JE	1
FD	1
LDC	5
Others	19
Total	**37**

Staff	Aizawl DFO	Lunglei DFO	Saiha DFO	Kolasib DFO	Mamit DFO	Champhai DFO	Serchhip DFO	Lawngtlai DFO	Total
	Numbers								
DFDO	1	1	1	1	1	1	1	1	**8**
FEO	3	2	2	2	1	0	0	0	**10**
AFO	8	5	3	2	1	1	1	1	**22**
FD	11	3	0	3	4	3	2	2	**28**
PPO	1	0	0	0	0	0	0	0	**1**
UDC	1	1	2	1	1	0	0	0	**6**
LDC	1	1	3	2	1	0	0	0	**8**
Others	12	9	1	4	1	0	1	2	**30**
Total	**38**	**22**	**12**	**15**	**10**	**5**	**5**	**6**	**113**

Note: Establishment means Administration; DFO = District Fisheries Officer; FEO = Fisheries Extension Officer
JE = Junior Engineer; FD = Fisheries Demonstrator; DFDO = District Fisheries Development Officer
FM = Farm Manager; Lower Divisional Clerk; UDC = Upper Division Clerk; PPO = Power Pump Operator
Source: Compiled and simplified from the Organisational Chart of DOF by the JICA Study Team 2014

Figure 4.7.1 Organisational Setup of the Department of Fisheries

(3) Ongoing Programmes of the DOF

The ongoing programmes of the DOF are summarised in Table 4.7.1.

Table 4.7.1 Ongoing Programmes of DOF

No	Project/Programme	Sponsored by National or State	Outline of Project/Programme
1	Fish Seed Production cum Farming	GOM	· Maintenance of existing departmental fish seed farms · Cost of inputs, labour charges, etc., for production of fish seed
2	Freshwater Aquaculture	CSS and NFDB GOI: GOM 75:25	· Construction of new pond · Renovation/reclamation of existing ponds · Cost of inputs: fish seed, fish feed, etc. · Integrated fish farming through the Mizoram Cooperative Fish Farming and Processing Federation Ltd. (ZOFISFED) · Installation of aerator
3	Development of Inland Capture Fisheries (Reservoir/ Rivers, etc.)	CSS GOI: GOM 75:25	· State plan · Maintenance of existing infrastructure developed in the past · Through the Centrally Sponsored Scheme for Development of Inland Fisheries Statistics (CSS &N FDB) · Cage culture

No	Project/Programme	Sponsored by National or State	Outline of Project/Programme
			・ Cost of inputs for reservoir fisheries ・ Purchase of crafts and gears ・ Establishment of landing centre ・ Reservoir fisheries conservation and awareness programme
4	Development of Cold Water Fisheries and Ornamental Culture	GOI	・ Maintenance of the existing one ornamental hatchery unit ・ Capacity building of entrepreneurs
5	Development of Inland Fisheries Statistics	CSS (100%)	・ The scheme provides for maintenance of the ongoing Centrally Sponsored Scheme for Development of Inland Fisheries Statistics through information, networking, and survey. The scheme is functioning with 100% grant-in-aid from the central government towards salaries of staff.
6	Inland Fish Marketing	State	・ Maintenance of existing ice plant and cold storage and wages of labour
7	Information Extension and Training	CSS GOI: GOM 75:25 (Training 80:20)	・ Publication of magazines, booklets, display of advertisements, etc. ・ Farmers' tour to outside state and training of in-service personnel/ stipend and book grant for Bachelor of Fisheries Sciences (BFSc) candidate.
8	National Scheme for Welfare of Fisherman	CSS GOI: GOM 75:25	・ Construction of fishermen house ・ Construction of water point ・ Construction of community hall
9	National Mission for protein Supplement of Rashtrya Kishan Vikas Yojana (RKVY)	GOI (100%)	・ Supply of first year input to ponds and tanks ・ Establishment of feed mill ・ Establishment of fish seed infrastructure in the government and private sector including first year input ・ Construction of godown and marketing infrastructure ・ Construction of district godown ・ Construction of minor retail market ・ Capacity building of farmers ・ Training of farmers ・ Establishment of farmers' training centre including cost of teaching aids ・ Establishment of a museum

Source: DOF

4.7.2 Current Situation of Inland Fishery

(1) Fish Seed Distribution and Fish Production

(a) Fish Species Cultured in Mizoram

Almost all the fish farmers in the vicinity of the fish seed farms FSFs are dependent on the fingerlings from DOF. The commonly cultivated six species, namely, rui (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus mrigala*), silver carp (*Hypothalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), and common carp (*Cyprinus carpio*), are considered to be the best culturable species of fish in the inland water system (refer to Table 4.7.2). These fish species originally belong to riverine environment and are cultured in standing water such as ponds and tanks; they attain maturity, but normally do not breed under confined conditions. They have to undergo artificial induced breeding by stimulating their endocrine system.

Table 4.7.2 Fish Species Commonly Cultured in Mizoram

No	Fish Species	Salient Characteristics	Pictures
1	Common carp *(Cyprinus carpio)*	・ Bottom feeder and omnivorous ・ Breeds during January to March and can breed in stagnant water ・ Can reach 1-2 kg in one year	
2	Catla *(Catla catla)*	・ Surface feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	

No	Fish Species	Salient Characteristics	Pictures
3	Rohu *(Labeo rohita)*	・ Column feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
4	Mrigal *(Cirrhinus mrigala)*	・ Bottom feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
5	Silver carp *(Hypophthalmichthys molitrix)*	・ Surface feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
6	Grass carp *(Ctenopharyngodon idella)*	・ Feed on grass ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	

Source: DOF

(b) Fish Seed Production and Distribution

There are 11 government fish seed producing hatcheries in Mizoram; of which only four hatcheries are operated by DOF while the rest are leased to ZOFISFED. DOF is mandated to distribute its own production as well as to procure from the private hatcheries and distribute to fish farmers. There are three private hatcheries in Mizoram that produce and supply to DOF as well as its own sales to fish farmers. The available data of DOF on fingerling production and distribution together with the procured fingerlings from three private hatcheries are tabulated in Table 4.7.3. On an average, the government produces around a million of fingerlings for distribution to fish farmers, and the rest are from private hatcheries. The private hatcheries also procure fish fingerlings from neighbouring states, Assam and Tripura, to supply to DOF as well as to sell to fish farmers. However, the records or data of inflow of fish seeds are not available in DOF.

Table 4.7.3 Number of Hatcheries and Production and Distribution of Fingerlings (1,000 nos.)

Districts	No. of Hatcheries			2008/2009***		2009/2010		2010/2011		2011/2012		2012/2013	
	Govt	Private	Total	Prod*	Distri**	Prod*	Distri**	Prod*	Distri**	Prod*	Distri**	Prod*	Distri**
Mamit	-	1	1			300	4,900	395	16,200	400	10,200		4,000
Kolasib	-	2	2			-	4,500	-	10,000	-	10,000		4,200
Aizawl	2	-	2			200	2,700	200	8,700	200	8,700		3,400
Champhai	-	-	-			-	1,700	-	7,100	-	7,100		2,400
Serchhip	-	-	-			-	1,300	-	7,500	-	7,500		3,300
Lunglei	1	-	1			200	3,300	200	9,200	200	9,200		2,400
Lawngtlai	-	-	-			-	2,700	50	4,800	200	4,800		2,200
Saiha	1	-	1			200	1,800	-	7,000	-	7,000		2,100
Total	4	3	7	-	-	900	22,900	845	70,500	1,000	64,500	-	24,000

Note: 1. There are 11 fish seed farms and 2 demonstration farms owned by DOF in Mizoram.
*2. (*) Fish seed production of government fish farms.*
3. (**) Distributed number of fish seed include both from FSFs and private hatcheries.
4. (***) Data for 2008/2009 on production and distribution of fish seeds are not available.
Source: Prepared from the database of DOF, Mizoram

The total number of fingerlings procured and distributed by DOF was 64.5 million fingerlings in 2011-2012 (refer to Table 4.7.4), which included the government fish seed production of 1.0 million (around 2%) of the total distributed. However, DOF does not have the record of fingerlings by fish species produced and distributed. The production numbers of ZOFISFED-managed FSFs are also not available in DOF.

Table 4.7.4 Number FSFs and Production of Fish Fingerlings in Mizoram (2011/2012)

Districts	Number of Fish Seed Farms			Production (no.)		No. of Fingerlings Procured and Distributed by DOF**
	Government Owned		Private Hatcheries	Government Operated	Private Hatcheries*	
	Government Operated	Leased to ZOFISFED				
Mamit	1	3	1	400,000		10,200,000
Kolasib	0	1	2	-		10,000,000
Aizawl	2	0	0	200,000		8,700,000
Champhai	0	0	0	-		7,100,000
Serchchip	0	1	0	-		7,500,000
Lunglei	1	2	0	200,000		9,200,000

Lawngtlai	1	0	0	200,000		4,800,000
Saiha	0	1	0	-		7,000,000
Sub-total	**5**	**8**	**3**	**1,000,000**		**64,500,000**
Total		**13**	**3**			

Note:(*) denotes that fingerling production is not available in DOF, it procures from private hatcheries.
(**) denotes that fingerling production of government-operated FSFs is included in the distribution.
Source: Compiled from the database of DOF by the JICA Study Team, 2014.

(c) Fish Production

The number of fishpond area and fish production from 2005/2006 to 2012/2013 is summarised in Table 4.7.5 based on the data provided by DOF. The production showed an increase from 3,750 t in 2005/06 to 5,450 t in 2012/13 except for a drop below 3,000 t for three years (2007/08 to 2009/10). It must be noted that fish production from 2010/11 to 2012/13 included the capture fisheries. Fish farming (culture fisheries) is very dependent on the availability (production and distribution) of fish fingerlings. Fish production corresponds to the increase in the number of fishponds and area.

Table 4.7.5 Number and Area of Fish Ponds and Production (2005/2006 – 2012/2013)

Districts	**2005/2006**			**2006/2007**			**2007/2008**			**2008/2009**		
	(nos)	**(ha)**	**(t)**	**(nos)**	**(ha)**	**(t)**	**(nos)**	**(ha)**	**(t)**	**(nos)**	**(ha)**	**(t)**
Mamit	992	517	751	1,007	520	753	1,029	588	853	1,075	798	596
Kolasib	1,472	692	1,008	1,485	696	1,009	1,508	762	1,105	1,530	962	620
Aizawl	823	150	218	830	151	219	842	172	103	890	222	225
Champhai	752	134	194	760	135	195	775	166	166	802	231	200
Serchhip	624	95	137	635	95	138	646	117	117	668	184	133
Lunglei	1,030	311	452	1,035	313	451	1,038	353	212	1,050	483	460
Lawngtlai	1,038	488	710	1,047	491	710	1,053	502	301	1,075	597	362
Saiha	461	194	281	480	197	282	491	215	150	536	325	295
TOTAL	**7,192**	**2,580**	**3,750**	**7,279**	**2,597**	**3,759**	**7,382**	**2,876**	**3,008**	**7,626**	**3,803**	**2,891**
Districts	**2009/2010**			**2010/2011**			**2011/2012**			**2012/2013**		
	(nos)	**(ha)**	**(t)**	**(nos)**	**(ha)**	**(t)**	**(nos)**	**(ha)**	**(t)**	**(nos)**	**(ha)**	**(t)**
Mamit	1,530	828	602	1,702	965	1,302	1,565	838	1,383	1,826	995	1,493
Kolasib	1,817	997	625	1,965	1,032	1,392	1,838	1,004	1,656	2,110	1,035	1,753
Aizawl	988	237	227	1,020	241	289	1,004	242	230	1,167	291	276
Champhai	912	251	203	935	296	355	937	259	259	1,085	303	304
Serchhip	757	196	135	773	213	198	776	202	202	857	226	227
Lunglei	1,262	495	462	1,275	405	445	1,276	499	399	1,446	550	440
Lawngtlai	1,224	609	364	1,261	425	467	1,238	613	552	1,526	699	629
Saiha	737	340	298	755	402	442	756	345	311	821	365	328
TOTAL	9,227	3,954	2,916	9,686	3,979	4,890	9,390	4,002	4,991	10,838	4,465	5,450

Source: Prepared from the database of DOF, Mizoram

(2) Fisheries Support Facilities

(a) Fish Farms and Fingerling Production

1) Fish Farms - Fish Seed Production and Demonstration Farm

There are 13 government-owned fish farms (refer to Table 4.7.6), and three privately-owned fish hatcheries in Mizoram with breeding, hatching, and rearing ponds. The government-owned fish farm facilities are located in seven districts, namely, Mamit, Aizawl, Lunglei, Kolasib, Serchchip, Lawngtlai, and Saiha. Only Champhai District has no fish farm for seed production. The three privately-operated fish hatcheries are located in Kolasib (2) and Mamit (1).

Source: DOF, Mizoram

Photo 4.7.1 Lengpui Fish Seed Farm

Of the 13 government-owned FSFs (refer to Table 4.7.6), three are demonstration farms that are located in Aizawl (Rungdil), Saiha (Maubawk), and Lunglei (Phairuang), and the rest are fish seed producing farms. DOF manages five fish farms located in Aizawl (Lengpui and Tamdil), Lawngtlai (Ngengpui), Lunglei (Zobawk), and Saiha (Maubawk). Eight fish farms are leased to ZOFISFED on a ten-year lease to manage and produce fish seeds to supply to its primary society members. However, only three are functional, the other five were damaged in 1995 (after a heavy rain) and are presently not functional. GOI has allocated funds and currently waiting to commence rehabilitation.

Table 4.7.6 Names and Locations of DOF FSFs and their Status

	Name of Farms	Location	Districts	Year Established	Management	Status
1	Laldenga Fish Seed Farm	Lengpui	Aizawl	1992-93	DOF	Functional
2	Zawlnuam Fish Seed Farm*	Zawlnuan	Mamit	2000-2001	ZOFISFED	Functional
3	Darlak Fish Seed Farm*	Darlak	Mamit	1990-91	ZOFISFED	Not functional
4	Saikhawthlir Fish Seed Farm*	Saikhawthlir	Mamit	1998-99	ZOFISFED	Not functional
5	Tamdil Fish Seed Farm	Tamdil	Aizawl	1972	DOF	Functional
6	Ngengpui Fish Seed Farm	Ngengpui-kai	Lawngtlai	1989-90	DOF	Functional
7	Zobawk Fish Seed Farm	Zobawk	Lunglei		DOF	Functional
8	Thenzawl Fish Seed Farm*	Thenzawl	Serchchip	1981	ZOFISFED	Functional
9	Rungdil Demonstration Farm*	Rungdil	Aizawl	1984-85	ZOFISDED	Functional
10	Tawipui Fish Seed Farm*	Tawipui-north	Lunglei	1987-89	ZOFISFED	Not functional
11	Chemphai Fish Seed Farm, Bilkhawthlir*	Chemphai	Kolasib	1980-81	ZOFISFED	Not functional
12	Sopali Demonstrator Farm	Maubawk	Saiha	1977	DOF	Not functional
13	Phairuang Demonstration Farm*	Phairuang	Lunglei	1977-78	ZOFISFED	Not functional

Note: 1. Asterisk denotes FSFs leased to ZOFISFED Ltd. on a 10-year lease.
2. Only three FSFs leased to ZOFISFED are operating; the others are not functional due to damage in 1995 (after heavy rain), awaiting to be rehabilitated with funds already allocated (Rs.203 lakhs).
Source: DOF

2) Facilities of Fish Farms

The fish farms have the essential components that are: (i) brood ponds to hold adult fish for spawning; (ii) hatchery facilities for spawning hatching and raising to postlarval stage; (iii) nursery ponds for rearing postlarvae to fry stage; and (iv) rearing ponds for growing fry to fingerlings. However, there are some structural design differences in breeding, hatchery, larvae rearing facilities, etc., for the Indian major carps and the Chinese carps. Structural designs are necessary considering that these two major carp groups will not breed in captivity; naturally, they breed only in flowing waters of natural habitats (rivers). In captivity (or in fish farms), they are required to induce spawning or breeding by injecting extracts of pituitary glands, and also require different facilities, ponds, and tanks.

(b) Ice Plant Cold Storage, Fish Feed Mill (FFM), and Other Facilities

1) Ice Plant Cold Storage (IPCS)

DOF has an IPCS facility in Bawngkawn (Aizawl) with an installed capacity that produce 130 blocks (50-kg/block) a day, and a 5-ton cold storage (refer to Table 4.7.7). Currently, it produces only 90 blocks a day and sells at subsidized price of INR.200/block (market price is Rs.400/block). The peak demand for ice is from April to August. The cold storage is in fairly good condition, but it is not in operation now due to non-availability of fish for storage.

2) Ice Plant (IP)

DOF has two ice plants without cold storage facilities, which are located in Kolasib District (Bilkhowthlir and Kolasib); each has a capacity to produce 100 blocks (15 kg/block) daily. The sale price is Rs.30/block (the market price is Rs.60/block). The shortage of water is the main problem according to the technician in charge.

Table 4.7.7 Government-Owned Ice Plants and Cold Storage in Mizoram

Districts	Number	Capacity	Ownership
Kolasib	1	200 blocks*/day	DOF
	1	200 blocks*/day	ZOFISFED***
Aizawl	1	130 blocks**/day	DOF
	1	3-ton cold storage	DOF

Note: 1. (*) 15-kg block ice and sale price is Rs.30/block (subsidised price).
2. (**) 50-kg block ice and sale price is Rs.100/block (subsidised price).
3. (***) ZOFISFED has planned to acquire two new ice plants soon.
4. No data available on the ice plants in the private sector.
Source: DOF and ZOFISFED

3) Fish Feed Mill (FFM)

DOF has a fish feed mill in Laldenga (Mamit), which is located within the Laldenga Fish Farm. The mill was established in 2013 under Rashtriya Krishi Vikas Yojana (RKVY) during 2012-2013 with the financial fund of GOI, and it has a capacity to produce fish feed at 200 kg/day (56 t/year). According to DOF, two similar fish feed mills are now being constructed in Saitual and Lengpui (both in Aizawl District). To date the fish feed mill is not operating due to non-availability of operational budget.

4) Cold Storage Room (Private Sector)

Four cold storage rooms (each room has four chambers) and 12 refrigerated vans (three for each cold room) had been established in 2013 with a GOI fund of Rs.519 million. A private proprietor whose contribution is 25% of the total fund will operate and manage these facilities. The cold rooms are located in Chemphai, Aizawl, Bukvnnei, and Zamuang. Currently, these marketing infrastructure facilities are not yet in operation.

5) Vehicles for Fish Marketing (ZOFISFED)

Some Rs.301 lakhs have been allocated by GOI for the purchase of vehicles (five refrigerated vehicle, five insulated vans, ten three-wheelers, and twenty motorcycles) under the post-harvest infrastructure scheme. The vehicles are for ZOFISFED, which has already acquired two refrigerated vans, one insulated van, thirteen three-wheelers, and two motorcycles. These acquired vehicles will be operated and managed by 22 primary societies of ZOFISFED. There is no data or information available on the performance of these vehicles at the time of the survey.

6) Floating Fish Cage Culture (*Pangasius*) of Catfish (DOF)

The floating fish cage culture of catfish (*Pangasius*) is being conducted on a trial by DOF in a reservoir (2,500 ha) in Kolasib where Serlui 'B' Hydropower Station is located. This scheme began in 2013 where DOF has installed two batches of floating cages. Each batch has 24 cages (size of each cage is 3x3x3 m). Fingerlings of *Pangasius* sourced from Tripura State, are stocked at 9,000 per cage and fed with floating fish feed. In addition, this reservoir has been stocked with fish seeds under the Riverine Fisheries

Development Programme (NFDB) during 2008-2011. DOF has a plan to lease out this water body for fishing on a five-year lease at Rs.4.5 million.

7) Paddy-Cum-Fish Culture (ZOFISFED)

ZOFISFED has begun a paddy-cum-fish culture scheme in 2013 with a fund of Rs.202 lakhs from the central government. It plans to introduce 800 ha of paddy farms to fish culture. Some 780 ha of paddy farmers of 22 primary societies shall be involved in the scheme (There are 68 primary service societies, of which 22 societies are member of ZOFISFED).

4.7.3 Development Plan of Fish Farming (Aquaculture)

According to the policy of Mizoram State, the ultimate target of the inland fishery sector is to attain self-sufficiency in fishing in order to provide per capita consumption of 11 kg by 2015. Toward this target, the state government has to challenge various issues and constraints that the fisheries sector is currently facing.

(1) Constraints and Measures in Inland Fishery (as noted by DOF)

The DOF clarifies the lack of fund and insufficient human resources and technical capability as the major constraints to the increasing fish farmers and facilities. Nevertheless, DOF has set forth the following remedial measures in the 12th Five-Year Plan:

i) Expansion of aquaculture resources through construction of new ponds and tanks and renovation of existing ponds and tanks to achieve the required production level;
ii) Creation and development of new fish seed infrastructures such as seed farm with hatcheries, rearing areas, and seed distribution centres to run on public-private partnership (PPP) basis to reach self-sufficiency in fish seed production;
iii) Setting up of fish feed mills to manufacture high feed conversion ratio (FCR) fish feed to compensate or supplement natural feeds;
iv) Strengthening extension support to educate farmers with improve and scientific methods of fish farming through training and demonstration;
v) Development and setting up of efficient marketing networks;
vi) Development of the open waters, i.e., riverine and reservoir fisheries sector for offering permanent settlement to shifting cultivators;
vii) Strict observance of the provision of Fishery Act 2002, for conservation of open waters;
viii) Reorganisation of DOF through creation of new fishery technical posts;
ix) Assured flow of fund from CSS, NFDB, RKVY, etc., for accelerating the pace of development in the sector; and
x) Revision of unit cost, increase of subsidy components to farmers, and reduction of quantum of matching share by the state from existing 75:25 to 90:10 between centres and states for various activities under CSS and NFDB.

(2) Proposed Development Activities under the 12th Five-Year Plan

The policy, vision, and development approach of the 12th Five-Year Plan is summarised below.

(a) Policy and Vision

The policy approach pursued in the state for development of the fishery sector in the 12th Five-Year Plan is concentrated towards protein-based food security. It aims to achieve an 11 kg per capita availability of fish from the state-owned resources as well as to create self-employment opportunities to local youth, both in the production of fish and in the ancillary activities related to fish farming such as, fish marketing, fish seed infrastructures, and feed mill plants. The policy also states the judicious management of natural resources in line with provision of the Mizoram Fisheries Act 2002 during the 12th Five-Year Plan period. The vision is to attain a sustainable development of the fishery sector in the state of Mizoram for food security and livelihood support.

(b) Development Approach

DOF proposed to develop another 3,000 ha of new fishponds and tanks to have a total of 7,000 ha in the fish culture sector of the state, wherein it expects the production level at the end of the 12th Five-Year Plan to be around 14,000 t. The proposed plans are summarised in Table 4.7.8

Table 4.7.8 Proposed Activities of the 12th Five-Year Plan

Proposed Activities	Outline of Activities	Physical Target	Financial Target (Rs. lakhs)
1. Construction of additional new ponds for fish farming	Create another 3,000 ha of new aquaculture ponds in the private sector in a cluster approach in order to facilitate connectivity of marketing and input supply through NFDB, FFDA, NLUP, NEC, ACA, and state plan scheme programmes.	3,000 ha	827
2. Renovation of existing fish farms		2,000 ha	375
3. Supply of one-time inputs covered under SL numbers 1 and 2	Supply one-time (first year only) inputs to newly constructed and renovated ponds in order to augment unit area productivity from the existing 1.25 t per ha to 2.0 t to 2.50 t per ha.	5,000 ha	625
4. Integrated farming including freshwater prawn polyculture in existing ponds and tanks covered under SL 2.	Popularise and adopt integrated farming by the farmers integrating livestock, crustacean, and horticultural plants, where the excreta of the livestock and leaves and seeds of the horticultural plant can be utilised in order to compensate fertilizers/feed requirements of fish stock. Thereby production cost of the fish can be largely reduced offering higher financial return.	2,000 ha	600
5. Cultivation of *Pangasius sutchi* in existing ponds		500 ha	325
6. Installation of aerator for intensive farming	Install aerators to support proposed activities above SL numbers 2 and 3.	200 ha	160
7. Establishment of new freshwater fish seed hatcheries	Establish fish seed farm with hatchery to operate on PPP basis involving capable private individuals in order to attain self-sufficiency in fish seed production to achieve a production level of at least 65 million annually by the end of the 12th Five-Year Plan Period.	4 units	64
8. Establishment of new freshwater prawn hatchery and ornamental fish seed hatchery	Establish initially one prawn hatchery in the government sector to take up prawn farming in limited potential areas, which is considered highly return-oriented.	2 units	60
9. Development of rearing farms for raising fingerlings	Establish fry rearing farms to raise fingerlings that would encourage small-scale farmers to participate in seed production to cater local demand of fish seed.	70 ha	200
10. Development of reservoir fisheries	Develop reservoir fisheries in the hydro-electricity and irrigation reservoir by providing water rights to DOF for piscicultural activities.	7,000 ha	100
11. In-situ pen culture units for reservoir fisheries	Develop reservoir fisheries in the hydro-electricity and irrigation reservoir by giving water rights to DOF for fish culture activities.	28 units or 14 ha	50
12. Incentive to caretaker villages (VC/YMA) for conservation of riverine/reservoir fisheries		200 units	100
Total			3,486

Source: 12th Five-Year Plan and Department of Fisheries

(3) Expected Outcome of the 12th Five-Year Plan

DOF expects the outcome of the above-proposed 12 activities, among others as follows:

i) Augmenting marketable fish production level at 14,000 t annually;
ii) Additional production of freshwater prawn, pigs, poultry, birds, and eggs from integrated fish

farming offering self-employment to additional 7,000-8,000 families in aquaculture activities;
iii) Augmentation of unit area productivity from 1.25 t/ha to 2.0-2.5 t/ha;
iv) Self-sufficiency in finfish seed, freshwater prawn seed, and ornamental fish seed by producing an estimated 55 million fish seeds (fingerlings) and required quantity of freshwater prawn and ornamental fish seeds;
v) Additional production of 1,000-1,200 t of marketable fish from the reservoir fisheries sector;
vi) Permanent settlement of about 1,400-1,500 shifting cultivation families in capture fisheries sector in the reservoirs;
vii) Availability of low-cost high FCR fish feed within the state; and
viii) Self-employment of about 150-200 families in the marketing sector and various ancillary activities related to the sector.

4.7.4 Implementation and Progress of NLUP

(1) The NLUP Programme for Inland Fishery Sector

The NLUP programme started since 2009/10 for over a period of five years under DOF and it aims to create and develop 1,500 ha of new ponds and tanks for additional production of fish in a period of five years. With its schemes/projects, it also aims at permanent settlement of *jhumia* families in the semi-intensive fish farming activities in various niches of available land for generating augmented income from holding, and thereby alleviates the destructive *jhum* cultivation. The scheme will impart training to the farming families covered under the programme with modern technology of fish farming through training and demonstration. It will also develop an efficient marketing network for smooth distribution and marketing of fresh fish and other products produced under the programme by way of establishing a mini-ice plant and creating a fish transporter in the private sector.

The objectives of the programmes under the NLUP are as follows:

i) Creation of 6,000 ha of new water bodies covering 3,000 families for semi-intensive fish farming;
ii) Polyculture of carps and giant freshwater prawn in 1,000 ha of new ponds of 6,000 ha of new water bodies to be developed in the comparatively warmer zone of the state;
iii) Supply of first year inputs such as lime, fish seed, prawn post larvaes (PLs), prawn feed including nets and gears to the beneficiary families covered under the programme;
iv) Establishment of eight fish seed farms (district level) including hatchery with a production target of 8-10 million fry for each seed farm in order to meet the present fish seed requirement and requirement of the new water body created under the NLUP programme;
v) Development of ten mini-ice plants and 40 fish transports in the private sector by arranging subsidy in the amount of Rs.5 lakhs per unit for ice plant and Rs.4 lakhs per unit of transporters (especially designed low constant volume fume hoods (LCV) with required insulated boxes and other accessories); and
vi) Demonstration and training of all beneficiaries covered under the programme for ten days (in two phases of five days each) in line with the provisions and patterns of NFDB.

(2) Development Programme under NLUP

(a) Target Beneficiaries and Required Expenditures

Table 4.7.9 Target Beneficiaries and Required Expenditures

Sl No.	Phases	Target Beneficiaries and Area		Required Expenditure (in Rs. lakhs)
		Beneficiaries (nos)	Area (ha)	
1	1st phase	600	300	600.00
2	2nd phase	600	300	600.00
3	3rd phase	600	300	600.00
4	4th phase	600	300	600.00
5	5th phase	600	300	600.00
	Total	**3,000**	**1500**	**3,000.00**

Source: Provided by DOF to the JICA Study Team, 2014

(b) Infrastructure Component

Table 4.7.10 Target Infrastructure Components

SI No.	Infrastructure	Units	Estimated Amount (Rs.)
1.	Repair and renovation of hatcheries in Tamdil, Thenzawl, Ngengpui, and Zobawk fish seed farms	4	19,04,980
2.	Purchase of equipment and glassware for upgrading of the Farmers Training Centre in Lengpui Fish Seed Farm	1	2,49,970
3.	Establishment of Fish Feed Mill in Kolasib	1	25,00,000
4.	Construction of open well for sufficient supply of water in Tamdil Fish Seed Farm	1	5,00,000
5.	Repair of nursery and rearing ponds in Ngenpui, Tamdil, and Thenzawl fish seed farms	3	1,22,97,682
	Total	10	1,74,52,632

Source: Provided by DOF to the JICA Study Team, 2014

(3) Performance and Progress of the NLUP Programme

(a) Beneficiaries and Area Covered and Expenditure

Table 4.7.11 No. of Beneficiaries and Expenditure Incurred

SI No.	Phase	Achievement		Amount of Expenditure (Rs. lakhs)
		Beneficiaries (nos)	Area covered (ha)	
1.	1st Phase	1,447	723.50	1,447.00
2.	2nd Phase	1,131	565.50	1,131.00
3.	3rd Phase	717	358.50	717.00
4.	4th Phase	359	179.50	359.00
5.	5th Phase	-	-	-
	Total	3,654	1,827.00	3,654.00

Source: Provided by DOF to the JICA Study Team, 2014

(b) Infrastructure Component

Table 4.7.12 Achievement in Infrastructure Component

SI No.	Achievement of Infrastructure Component	Units	Amount of Expenditure (Rs. lakhs)	Remarks
1.	Repair and renovation of hatcheries in Tamdil, Thenzawl, Ngengpui, and Zobawk fish seed farms	4	19,04,980	Completed
2.	Purchase of equipment and glassware for upgrading of the Farmers Training Centre in Lengpui Fish Seed Farm	1	2,49,970	Completed
3.	Construction of open well for sufficient supply of water in Tamdil Fish Seed Farm	1	5,00,000	Proposed to work order
4.	Repair of nursery ponds in Ngengpui Fish Seed Farm	1	7,57,277	Work order in place
	Total	7	34,12,227	

Source: Provided by DOF to the JICA Study Team, 2014

4.7.5 Development Issues/Constraints, and Potentials and Directions

(1) Development Issues/Constraints

The issues and constraints facing the fisheries sector, particularly in the fish farming or aquaculture, are summarised in Table 4.7.13.

Table 4.7.13 Issues and Constraints in Fisheries

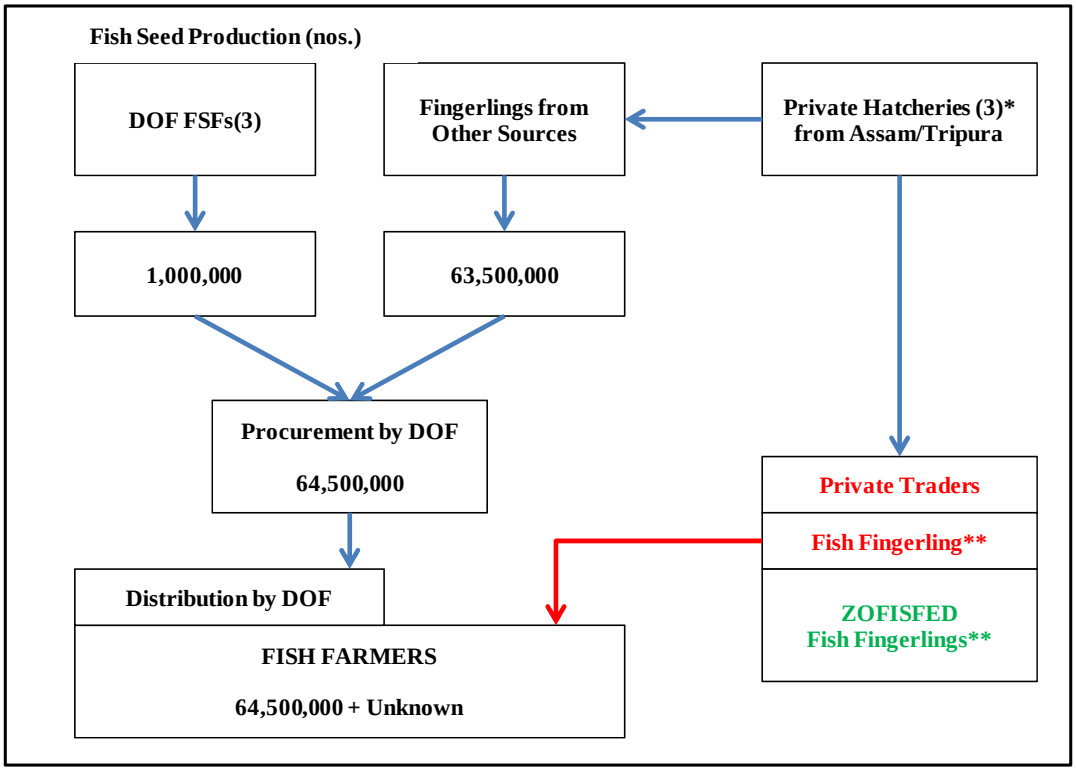
Items	Issues and Constraints	Causes and Reasons
A. Institutional Issues and Human Resources		
DOF and DFOs	・ Low performance of DOF and staff. ・ Roles and job descriptions of staff in DOF and DFOs are not stipulated by the act. ・ Ineffective use of human and financial resources. ・ DOF depends on schemes and external assistance or policy and guidance.	・ No fisheries act with rules and ordinance in place that would stipulate the roles, functions, and job descriptions of staff of DOF and DFOs in the field.
Statistical data and information	・ Unreliable statistics. ・ Lack of accurate and timely data/information on aquaculture activities. ・ No systematic record or data collection of: ・ Fry and fingerlings production at FSFs by fish species; 　・ Fingerlings procured and distributed by fish species from both public and private fish hatcheries, as well as those coming from neighbouring states; and 　・ Distributed fingerlings to fish farmers by locations, fish species, and quantity.	・ No system of regular data collection in the field. ・ Field staff are not trained to collect data/information. ・ Limited operational budget and trained staff both in DOF and in the field offices (DFOs).
Data on fingerlings and fish production	・ Low reliability of the reported fish fingerlings procured and distributed, and fish production data. ・ Difficult to grasp production performance and aquaculture practices by fish farmers due to unavailability of recorded data.	・ No record of harvested fish of fish farmers. ・ No system of regular data collection in the field offices (DFOs).
	・ Low reliability of fish fingerlings stocked numbers in fishponds (under or over estimated). ・ No data on the inflow of fingerlings and fish from neighbouring states (refer to Figure 4.7.2 for explanation). ・ Low reliability of fish produced in fishponds (under estimated (refer to Figure 4.7.3 for explanation).	・ Estimates of fish production are based on the total fishpond area (ha) and productivity rate of other states; aquaculture practices of other parts of India differ very much compared to Mizoram State. ・ Other estimate options are based on the total distributed fingerlings (using 50% to 75% survival rate and average weight of 1 kg/fish). This production quantity only reflects the total number of fingerlings procured and distributed by DOF. ・ Fingerlings sourced by the fish farmers themselves from private hatcheries and fish seed traders (from Assam and Tripura) are not accounted in the fish production.
Human resources (technical) and extension service	・ Weak extension and support service by DOF to fish farmers.	・ Lack of skilled and trained staff in DOF and DFOs. ・ Existing technical staff are unable to impart proper guidance and assistance to fish farmers. ・ Not adequately trained or lack capacity (knowledge base) to foster and develop fisheries.

Items	Issues and Constraints	Causes and Reasons
Fish farmers – (producers)	・ Limited or no skills in aquaculture practices. ・ Stand-alone activity, no skills, or mind-set to integrate fish with farming activities. ・ Too much dependency on subsidy. ・ No record of baseline data/information of aquaculture practice of fish farmers. ・ No information on the economics of extensive and semi-intensive aquaculture.	・ Fish farmers are agro-farmers who have no knowledge or technical skills in fish farming practices. ・ Some fish farmers are new to fish farming, therefore, weak capacity or skill in business planning. ・ No monitoring and evaluation by DOF/DFOs to grasp productivity of fishponds, distributed fingerlings, production performance of distributed fingerlings (of harvested fish), and aquaculture practices by fish farmers.
Fish traders and fish fingerling suppliers	・ No record of fish traders (especially of wholesale fish traders) and suppliers of fingerlings, etc.	・ No licensing system to provide permits.
Fisheries laws and regulations in the Fisheries Act 2002 and Fisheries Rules 2010	・ Weak and poor enforcement of laws and regulations on fisheries. ・ Fisheries Rules 2010 is entirely not enforced.	・ Lack of manpower and initiatives to enforce. ・ Mizoram Fisheries Rules 2010 passed by the state assembly but not signed for enforcement.
B. Fish Seed or Fingerling Production		
Fish seeds (fry and fingerlings)	・ Severe shortage of fish fry and fingerlings. ・ Very low production of government. FSFs; producing less than 2% of the distributed quantity. ・ Actual fish seed supply in the state is not known (refer to Figure 4.7.2 for explanation).	・ Only three government FSFs (out of the 11 FSFs) are operated by DOF but producing below its capacity. ・ Operation of the three FSFs is dysfunctional (not operating throughout the year) due to lack of funds, etc. ・ Eight FSFs are leased to ZOFISFED whose operational skills and performance are not known (no data recorded or collected by DOF).
Broodstock (spawners) for breeding	・ Poor quality of the brood stocks (spawners) for breeding. ・ Poor quality of eggs produced and the hatching rate may be low. ・ High mortality of produced spawns and fry in FSFs.	・ New brood stocks are not recruited regularly to prevent in-breeding problem in some fish species, and to improve the fecundity, quality eggs, spawn, and fry. ・ Brood stocks are not maintained and managed to sustain healthy and quality spawners for breeding. ・ Quality fish feeds are not fed to brood stocks due to lack of funds, etc. ・ Thereby, as a result of the above, affecting fecundity, breeding, and recruitment of healthy and good quality fry and fingerlings.
Imported fish fingerlings (from neighbouring states)	・ Possibly low quality fry/fingerlings (from distant hatcheries); results in high mortality in fishponds.	・ Susceptible to high mortality due to transport difficulty. ・ Likely to bring in fish diseases and parasites.
Leasing of fish seed farms to ZOFISFED	・ Leaseholders may conduct unsustainable practices due to lack of know-how on breeding technology, etc. ・ Leaseholders tend not to practice proper hatchery operations and management as a rule, where leaseholders are required to strictly follow.	・ Leasing encourages less responsibility to maintain the fish seed farms. ・ Leaseholder's technical skills and manpower to operate and manage the farms are not known.
C. Fisheries Support Facilities		
Government fish farms	・ Underutilisation of the existing fish farms. ・ Not adequately and effectively used for fish seed production. ・ Ponds, equipment, etc., are lying idle and deteriorating rapidly.	・ Farms operations depend only on funds from schemes and outside sources. ・ Limited development funds of DOF and state planning.

Items	Issues and Constraints	Causes and Reasons
Freshwater prawn hatchery facility	・ Newly constructed; not operating and thus lying idle and deteriorating.	・ Operational budget is not available on time to procure brood stocks and other essentials for operation.
Ice plants and cold storage	・ Operating below installed capacity. ・ Poor maintenance of the facilities.	・ Subsidised sales price of ice blocks cannot cover operational and maintenance costs.
Fish feed mill	・ Not operating regularly, lying idle, and deteriorating. ・ Dependency on fish feeds from neighbouring states. ・ Lack of quality fish feed mills and inadequate supply of quality fish feeds for aquaculture.	・ Operational budget is not available on time to procure basic raw material and essentials for operation.
Refrigerated vehicles	・ Newly acquired; not in operation.	・ No feasibility reports to validate the need of such vehicles under present situation.
Cold storage rooms	・ Newly established cold rooms in four locations; not in operation.	・ No feasibility reports to validate the need of such cold storage rooms under present situation.

Source: Prepared by the JICA Study Team, 2014

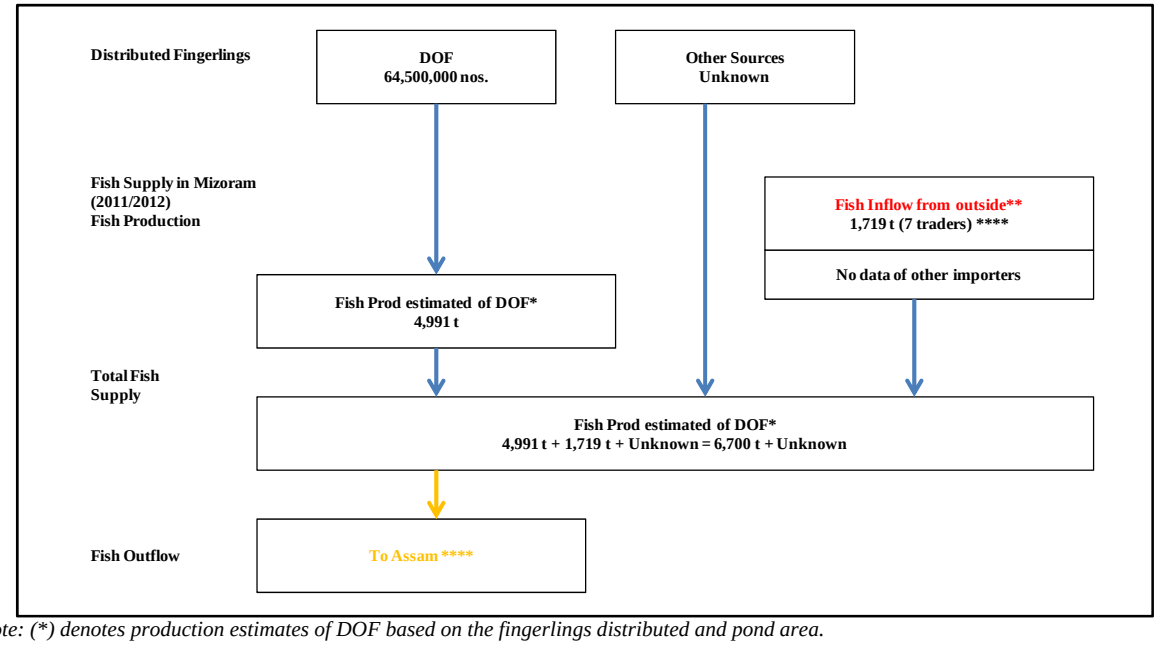
Figure 4.7.2 below shows that a substantial quantity of fish fingerlings is not accounted for in the procurement and distribution to fish farmers. Fingerlings of Assam/Tripura, supplied to fish farmers by fish seed traders in Mizoram, and the fingerlings produced by ZOFISFED are not accounted for when sold to or purchased by fish farmers. Therefore, the quantity of fish fingerlings stocked in the fish farms has to be more than the officially reported number of DOF. Thereby, the cultured fish production in Mizoram is not accurately reported.



Note:(*) denotes three private hatcheries (two in Kolasib and one in Mamit)
(**) fish farmers procure directly from private fingerlings when DOF distributed fingerlings are insufficient, and ZOFISFED produced fingerlings are not accounted for in the DOF distribution.
Source: JICA Study Team

Figure 4.7.2 Fish Seed Procurement and Distribution (2011/2012)

As a result of unknown quantity of fingerlings in the distribution as explained above, the production volume of fish should vary from the officially reported fish production in Mizoram. As shown in Figure 4.7.3, the officially reported quantity of 4,991 t (2011/12) reflects to the reported distribution of fingerlings (64,500,000) by DOF. Fish cultured and produced from fingerlings of other sources are not accounted. Further, seven fish traders in Aizawl had brought in about 1,719 t from Silchar (Assam) based on personal communication with one fish trader by the JICA Study Team. Similarly, there seem to be other traders in the state who are regularly consigning fish from neighbouring states. It is also known from the interview that some quantities of fish produced in Mizoram are taken out to the neighbouring states. Hence, the supply of fish in Mizoram could be more than the quantities reported by DOF.



Note: (*) denotes production estimates of DOF based on the fingerlings distributed and pond area.
(**) Fresh fish inflow from neighbouring states are not accounted for in the total fish supply.
(***) Quantity of fish consigned from Silchar (Assam) by seven wholesale traders in Aizawl in 2011/12 based on the interview survey.
(****) Produced fish of Mizoram is transported to Assam State based on the interview survey; however, the quantity of outflow is not known.
Source: JICA Study Team 2014.

Figure 4.7.3 Estimates of Fish Supply in Mizoram (2011/2012)

(2) Development Potentials and Directions

(a) Development Potentials

Despite several issues/constraints in the fisheries sector related to institutional settings, technology, and human resources, there are potentials for developing the aquaculture sector (fish farming) in Mizoram. The development potentials are summarised below.

i) Mizoram has a diverse water resource, and the climate is subtropical humid, which is suitable for development of aquaculture;
ii) Commonly culturable fish species (Indian major carps) are endemically present and some exotic fish species (Chinese major carps) had been introduced and are successfully farmed in the state;
iii) Some 13 fish farms (for fish seed production and demonstration facilities) exist (although most of them are underutilised and lying idle) which can be rejuvenated and put to a maximum use; and
iv) Fish farmers, who are agro-farmers primarily, had been exposed to fish farming through several schemes; these fish farmers are potential human resources that can be tapped for the development of aquaculture.

(b) Development Directions/Strategies

Development directions or strategies will strengthen the service providers (DOF, etc.), revitalise and improve the existing aquaculture infrastructure and fish culture technology and its dissemination to fish farmers. The directions are listed below.

i) Empowering the state fisheries administration (DOF) and district level administration (DFOs) with skilled manpower and extension services to fish farm levels;
ii) Empowering fish farmers and farmers to techniques of aquaculture, integrated fish-cum-chicken farming and paddy-cum-fish culture through demonstration and awareness campaign; and
iii) Integration of fish farming into rural livelihood or agriculture; thereby encouraging fish farmers to take up small-scale rural aquaculture partially or totally into the farming system and not to a stand-alone activity.

4.8 Livestock

4.8.1 Policy, Organisation and Plan

(1) National Level

(a) Policy and Vision

India's livestock sector is one of the largest in the world. It has 56.7% of the world's buffaloes, 12.5% cattle, 20.4% small ruminants, 2.4% camels, 1.4% equine, 1.5% pigs, and 3.1% poultry. The total output worth was higher than the value of food grains. Despite significant increases in livestock production, the per capita consumption of milk (69 kg) and meat (3.7 kg) in 2007 has been much lower against corresponding world averages of 85 kg and 40 kg[1]. Despite this, activities of the livestock sector in India play an important role in the national economy and in socioeconomic development of the country. In addition, generally livestock and its production system are mostly part of a mixed crop-livestock farming system that is vital for the security and survival of many poor farmers/people, particularly marginal and landless farmers.

In 2010-11 livestock generated outputs worth Rs.1,645 billion, which comprised 3.37% of gross domestic product (GDP) and 27.28% of agricultural GDP, and GDP of livestock to agricultural GDP has slightly increased during the recent three years. In April 2013, the National Livestock Policy 2013 formulated and approved by GOI to have a policy framework for improving productivity of the livestock sector in a sustainable manner of organisation and function. Its vision is to achieve sustainable growth of the livestock sector, including poultry, in order to attain nutritional security, employment generation, and economic prosperity, specifically focusing on increasing productivity of high market value products, enhancing animal genetic potential, strengthening livestock healthcare, and facilitating increased availability of fodder.

(b) Organisation and Function

The Department of Animal Husbandry and Veterinary's divisions under MOA are responsible for matters relating to livestock production, preservation, protection and improvement of stocks, and dairy development, and matters relating to the Delhi Milk Scheme and the National Dairy Development Board. This department advises the state governments in formulation of policies and programmes in the field of animal husbandry, and dairy development. The main focus of the activities is given to the following: (i) development of requisite infrastructure in states for improving animal productivity, (ii) promoting infrastructure for handling, processing, and marketing of milk and milk products, (iii) preservation and protection of livestock through provision of healthcare, and (iv) strengthening of central livestock farms for development of superior germplasm for distribution to states.

(2) State Level

(a) Status of Livestock and Policy

States in the North Eastern Region are ethnically and culturally akin to Southeast Asia, and for majority of the tribal population, livestock keeping, especially pig keeping, is integral to their way of life. Most of Mizoram's people are non-vegetarian, and their consumption especially of meat and eggs is relatively high, but of milk is very low. There is a growing demand especially for pork due to the increasing per capita income, urbanization, changes in lifestyle, and food habits, among other reasons. Much of this demand is met by imports from other states in India, and from Myanmar. However, the present growth rates of egg and meat production are very slow at 1.99% and 9.19%, respectively, and the state has limited potential to achieve considerable growth of the livestock sector over the next 10 to 20 years as it has to depend mostly on other states for quality animals, some of feed ingredients, semen, vaccines, and also the high cost of transportation of goods.

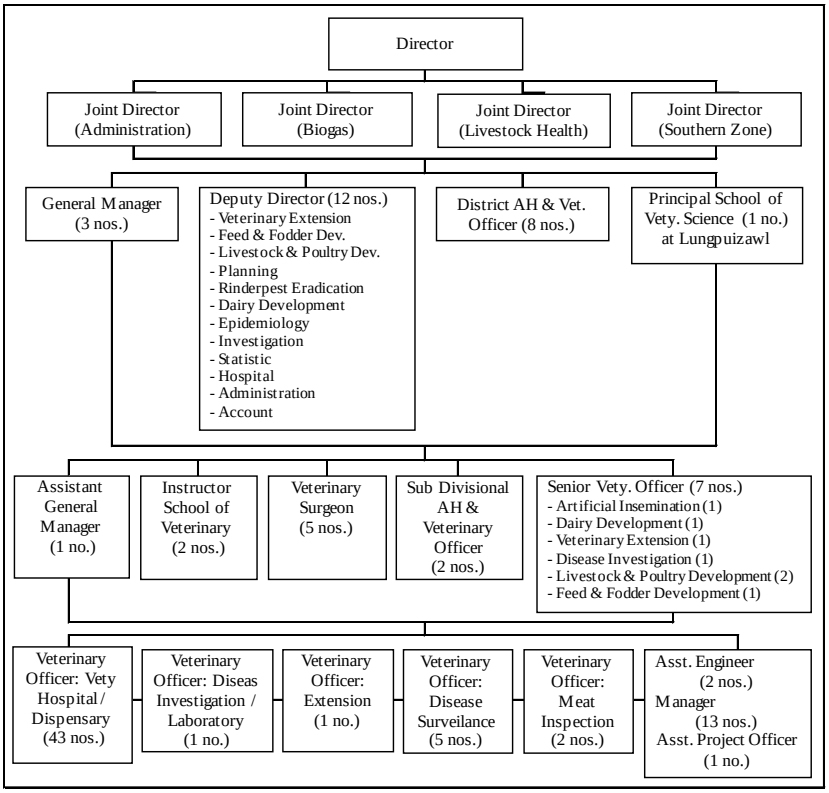
The contribution of the livestock sector to the agriculture gross state domestic product (GSDP) was around 9% only during the 12th Five-Year Plan period. Therefore, further improvement of a

[1] 2FAOSTAT. www.fao.org3Birthal (2008).

reality-based strategic planning system, and effective and efficient implementation / management and monitoring systems are indispensable for significant advancement in the livestock sector. The policy of the state on livestock and the strategic plan / action / indicator for the 12th Five-Year Plan are to: (i) achieve 50% of self-sufficiency in production of milk, meat, egg and fodder production by 2014–2015; and (ii) increase self-employment by 20% and entrepreneurship by gainfully employed rural youths by 2014-2015.

(b) Organisation and Function

The Department of Animal Husbandry and Veterinary (DAH&V) is headed by a director under whom are four joint directors. One of the joint directors is posted in Lunglei to supervise the work of the DAH&V in the southern part of Mizoram. The three joint directors are posted at the Directorate in Aizawl. The DAH&V has eight district offices, and two sub-divisional offices in Chawngte and Tlabung. The joint director in the southern zone (Lunglei) entrusted to supervise or look after the DAH&V's establishments located in the southern zone of the state. The organisational chart of the DAH&V is shown Figure 4.8.1



Source: DAH&V, Government of Mizoram

Figure 4.8.1 Organisation and Staffing of the DAH&V

The DAH&V is responsible for matters relating to (i) animal husbandry and veterinary services, and (ii) dairy development and upgrading of existing infrastructure for maintaining livestock health, and prevention and control of animal and poultry diseases. The DAH&V is engaged in 12 main works under the respective deputy directors, and operates a veterinary college in Aizawl. The main staff of the department numbers to 273 persons, and their educational background is shown in Table 4.8.1

Table 4.8.1 Educational Level of DAH&V Staff

Educational Level	Staff Number
PhD	1
MVSc	20
MA	1
University / College Graduate	118
High School Graduate	273

Source: DAH&V, Government of Mizoram

(c) Present Scheme and Plan

Shown in Table 4.8.2 is the centrally sponsored schemes implemented by the DAH&V.

Table 4.8.2 Centrally Sponsored Scheme Implemented by the DAH&V

National Project on Rinderpest Eradication Programme	It is implemented to make the state and the country Rinderpest disease free. Under this scheme, the DAH&V establishes six Rinderpest check points along the state boundary through which cattle enter Mizoram. Surveillance officers and supporting staff are posted in these check gates under this scheme.
Assistance to State for Control of Animal Diseases	Objectives are to: i) control emerging diseases, exotic diseases, and existing diseases in the state, ii) train field veterinarians as well as field staff, and iii) conduct surveillance and monitoring of diseases, and preparation of disease forecasting models.
Professional Efficiency (State Veterinary Council)	The scheme is taken up with the Mizoram State Veterinary Council that was established by an Act of Parliament in 1972. The objective of this scheme is to improve professional efficiency of veterinarians to enable them to solve day-to-day technical problems they face.
Sample Survey and Statistics	To carry out a realistic statistical survey and create records of different animals in the state with their production year wise and season wise, and also to conduct an animal census every five years as per directive from GOI.
Biogas Development	The DAH&V has been a nodal agency for the National Biogas and Manure Management Programme since 1982. The main activity is the installation of the biogas plant to farmers for maximising the utility of their livestock and by-products in order to obtain lighting and cooking fuel, organic manure, and also permanent sanitary fitting in rural areas. It will be continued in the 12th Five-Year Plan.

Source: DAH&V, Government of Mizoram

(d) 12th Five-Year Plan (2012–2017)

The state is going to continue to develop infrastructure and create conditions to increase production of animal products, such as milk, meat and eggs, and also to generate self-employment. In order to enhance and promote meat production, and to generate livelihood for the farmers and unemployed youths in the state, it is necessary to adopt new approaches in livestock and poultry farming for which the DAH&V envisaged on formulating schemes and programmes for the 12th Five-Year Plan with a proposed outlay of Rs.8,659 lakhs, as explained in Table 4.8.3.

Table 4.8.3 12th Five-Year Plan

Objective		Action		Success Indicator	Unit	Projected Value in 2014/15
1.	To enhance milk, meat and egg production.	1.1	Introduction of dairy cows under the New Land Use Policy (NLUP)	Increased milk production	t	15,000
		1.2	Introduction of better variety of birds	Increased egg production	lakh	3.70
		1.3	Introduction of piggery and Mithun	Increased meat production	t	13,000
2.	To improve breedable livestock population through artificial insemination and natural services by improved breeds.	2.1	Breed improvement through procurement of bull semen and artificial insemination (AI) network for cattle and pig	No. of AI in cattle	no.	5,800
				No. of AI in pig	no.	5,000
				No. of crossbred calf born	no.	4,200
		2.2	Establishment of boar semen station for artificial insemination (AI) in pigs	No. of semen stations established	no.	6
		2.3	Increase natural insemination through service of improved breeds	No. of improved bulls inducted for natural service	no.	40
3.	To enhance production of quality feed and fodder.	3.1	Production of high yielding fodder varieties	Fodder production	t	30,000
		3.2	Development of grasslands	Area of grasslands developed	ha	450
4.	To take up available insurance to support livestock activities.	4.1	Carrying out livestock insurance programme	No. of livestock insured	no.	2,500

Objective		Action		Success Indicator	Unit	Projected Value in 2014/15
5.	To enhance backyard poultry farming by inducting improved variety of poultry by augmenting the local varieties with improved varieties for increasing production.	5.1	Introduction of improved variety of poultry and distribution to farmers with support for poultry house	No. of improved birds distributed to farmers	no.	450,000
6.	To improve healthcare facilities for prevention and control of animal diseases.	6.1	Vaccination against important diseases	No. of vaccinations done	lakh	1.30
		6.2	Improvement of veterinary healthcare infrastructure	No. of hospitals	no.	11
				No. of dispensaries	no.	30
				No. of RAH Centres	no.	50
7.	To disseminate technical knowhow on management of livestock and poultry to farmers.	7.1	Conducting short-term training programmes	No. of farmers trained	no.	3,000
8.	To provide better collection, processing and marketing infrastructure.	8.1	Establishing modern meat shops	No. of units set up	no.	20
9.	To make producers and consumers aware of the benefits of clean and hygienic animal products.	9.1	Training programmes for milk, egg and meat producers	No. of producers trained	no.	300
10.	To build capacity of veterinary professionals for providing better resources to farmers.	10.1	Attending veterinary professional trainings outside the state	No. of trainings attended	no.	40
11	Efficient functioning of the RFD System	1)	Timely submission of draft for approval	On-time submission	Date	-
		2)	Finalize a strategic plan for the next five years	On-time submission	Date	-

Source: DAH&V, 2014, Government of Mizoram

4.8.2 Current Situation of Livestock Raising

(1) Kinds and Number of Livestock in Mizoram

States in the North Eastern Region have much higher pork consumption, and the tribal population in particular rear more pigs as shown in Table 4.8.4. Especially Mizoram shows highest population ratio (81.4%) in pigs among the states in the North Eastern Region.

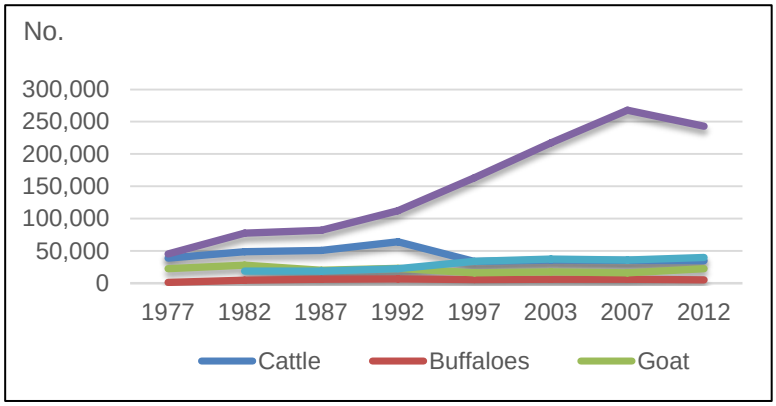
Table 4.8.4 Livestock Population in States in the North Eastern Region 2007 ('000)

States / UTs	Cattle	Buffaloes	Sheep	Goats	Pigs	Mithun	Total Livestock	% to All of India
Assam	10,041	500	354	4,320	2,000	0	17,227	3.25%
	58.3%	2.9%	2.1%	25.1%	11.6%	0.0%	100.0%	
Tripura	954	14	4	633	264	0	1,869	0.35%
	51.0%	0.7%	0.2%	33.9%	14.1%	0.0%	100.0%	
Meghalaya	887	23	21	365	524	0	1,823	0.34%
	48.7%	1.3%	1.2%	20.0%	28.7%	0.0%	100.0%	
Nagaland	470	35	4	178	698	33	1,419	0.27%
	33.1%	2.5%	0.3%	12.5%	49.2%	2.3%	100.0%	
Arunachal Pradesh	503	3	20	292	356	219	1,413	0.27%
	35.6%	0.2%	1.4%	20.7%	25.2%	15.5%	100.0%	
Manipur	342	62	9	51	314	10	789	0.15%
	43.3%	7.9%	1.1%	6.5%	39.8%	1.3%	100.0%	
Mizoram	35	6	1	16	267	2	328	0.06%
	10.7%	1.8%	0.3%	4.9%	81.4%	0.6%	100.0%	

States / UTs	Cattle	Buffaloes	Sheep	Goats	Pigs	Mithun	Total Livestock	% to All of India
Sikkim	135	0	3	92	35	0	270	0.05%
	50.0%	0.0%	1.1%	34.1%	13.0%	0.0%	100.0%	
Total of the North Eastern Region's States	13,370	643	416	5,948	4,461	264	25,145	4.75%
	53.2%	2.6%	1.7%	23.7%	17.7%	1.1%	100.0%	
All of India (35 States/UTs)	199,075	105,343	71,558	140,537	11,134	264	529,698	100.00%
	37.6%	19.9%	13.5%	26.5%	2.1%	0.0%	100.0%	

Source: Quinquennial Livestock Census of GOI

The population of poultry in Mizoram is the largest and followed by the pig population. Population of other livestock, such as cattle, buffaloes, and goats, are minimal in Mizoram. The livestock population during the past 35 years does not show a significant upward trend except for pigs, as shown in Figure4.8.2.



Source: DAH&V, Government of Mizoram

Figure 4.8.2 Population of Livestock in Mizoram in 1997-2012

The livestock population by district in 2012 is shown in Table 4.8.5. Other than poultry, the population of pigs is high in every district. Nearly 30% of the livestock population is concentrated in Aizawl District, followed by Champhai. Almost half of the population of buffaloes, mithum, and horses are in Champhai District, and almost half of the duck population is in Kolasib District.

Table 4.8.5 District-wise Livestock Population in 2012

Species	Mamint		Kolasib		Aizawl		Chanpai		Serchip		Lunglei		Lawngtlai		Saiha		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Pigs	26,273	11	23,469	10	**81,450**	**34**	37,789	16	12,061	5	18,541	8	24,800	10	18,124	7	242,507	100
Dog	3,190	8	2,691	7	**11,388**	**29**	4,307	11	2,176	5	6,887	17	5,973	15	3,102	8	39,714	100
Cattle	2,711	8	5,646	16	6,078	17	**7,337**	**21**	2,374	7	4,176	12	3,999	11	2,482	7	34,803	100
Goats	3,670	17	2,384	11	1,597	7	822	4	467	2	**5,641**	**26**	3,742	17	3,756	17	22,079	100
Buffaloes	75	1	102	2	312	6	**2,575**	**51**	609	12	40	1	388	8	927	18	5,028	100
Mithun	0	0	0	0	135	4	**1,858**	**57**	71	2	0	0	0	0	1,219	37	3,283	100
Horses	14	2		0	135	19	**318**	**46**	71	10	5	1	65	9	86	12	694	100
Sheep	168	26	84	13	40	6	**220**	**34**	0	0	10	2	68	11	50	8	640	100
Total	**36,101**	**10**	**34,376**	**10**	**101,135**	**29**	**55,226**	**16**	**17,829**	**5**	**35,300**	**10**	**39,035**	**11**	**29,746**	**9**	**348,748**	**100**
Fowl	86,713	7	104,889	8	**352,322**	**28**	184,767	15	96,690	8	225,104	18	105,385	8	97,259	8	1,253,129	100
Duck	572	9	**3,027**	**45**	494	7	352	5	16	0	1,931	29	291	4	20	0	6,703	100
Turkey	0	0	3	1	**403**	**97**	0	0	0	0	8	2	0	0	3	1	417	100
Total	**87,285**	**7**	**107,919**	**9**	**353,219**	**28**	**185,119**	**15**	**96,706**	**8**	**227,043**	**18**	**105,676**	**8**	**97,282**	**8**	**1,260,249**	**100**

Source: DAH&V, Mizoram 2014, Quinquennial Livestock

According to Land & Livestock Holdings Survey[2], there is an ownership pattern for livestock across operational holding sizes, as shown in Table 4.8.6. The table shows that cattle is mostly owned by medium farmers, while poultry and pigs are an important source of livelihood for the landless and marginal, small, and semi-medium farmers. Half of large farmers also own poultry and pigs.

[2] Land & Livestock Holdings Survey is conducted by the National Sample Survey Organization (NSSO: Government Organization) once every decade.

Table 4.8.6 Ownership of Key Livestock and Size of Operational Holding

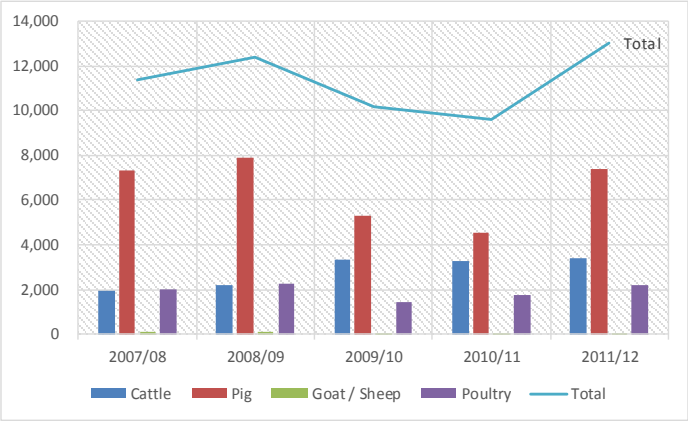
Size of Operational Holding	% of Households Reporting Ownership of			
	Cattle	Sheep/Goats	Poultry and Duck	Pigs and Rabbits
0 > 0.5 ha: Landless and Marginal	3.3	0.3	67.1	55.5
0.5 > 2.0 ha: Small	3.0	3.2	66.5	47.1
2.0 > 5.0 ha: Semi-medium	6.2	19.3	59.6	53.6
5.0 > 10.0 ha: Medium	50.0	0.0	50.0	0.0
10.0 > 20.0 ha: Large	0.0	0.0	50.0	50.0
All Size	**3.0**	**4.7**	**53.4**	**45.2**

Source: Land and Livestock Holding Survey, National Sample Survey Organization, 2003

(2) Livestock Production

(a) Meat Production

The total production of meat from cattle, sheep/goats, and pigs in 2011-2012 was estimated at 10,821 t, of which pork and beef accounts for 7,393 t and 3,364 t, respectively. Meat production from poultry (chicken and broiler) in 2011-2012 was estimated at 2,201 t. Out of the total meat production including poultry, pork had the highest quantity at 56.8%, followed by beef with a share of 25.8%, and poultry meat at 16.9%. The progress of meat production in the state in the past half-decade is shown in Figure 4.8.3. Meat production has decreased in 2009/10, and in 2011/12 for reasons of outbreaks of classical swine fever, but it again increased by 26% over the previous year. The amount of meat production from pigs, cattle and poultry is the highest in Aizawl District, followed by Lunglei District. The estimated pig, cattle and sheep/goat meat production by district in 2011/12 is shown in Table 4.8.7.



Source: DAH&V, Mizoram

Figure 4.8.3 Progress of Meat Production in Five Years

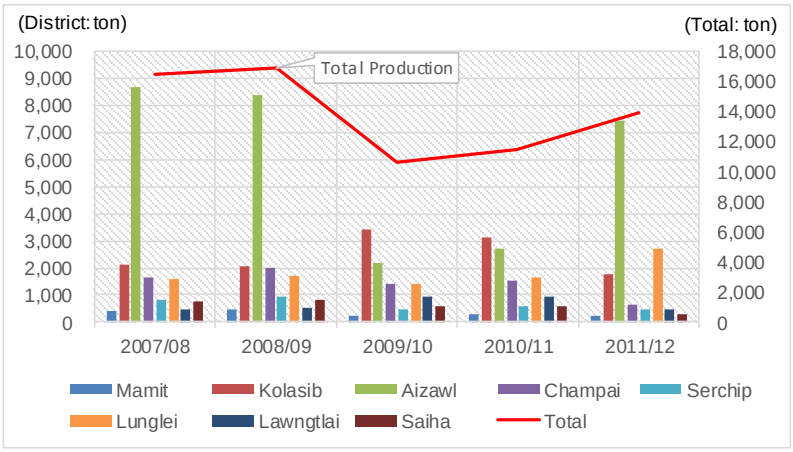
Table 4.8.7 Meat Production in Mizoram 2011-2012

District	Pig (t)		Cattle (t)		Sheep (t)		Poultry (t)	
Mamit	430	6%	220	7%	7	11%	109	5%
Kolasib	602	8%	174	5%	7	11%	116	5%
Aizawl	**3,511**	**47%**	**1,316**	**39%**	**14**	**22%**	**811**	**37%**
Champhai	451	6%	412	12%	2	3%	215	10%
Serchhip	461	6%	165	5%	3	5%	167	8%
Lunglei	**786**	**11%**	**694**	**21%**	**24**	**38%**	**621**	**28%**
Lawngtlai	587	8%	211	6%	0	0%	86	4%
Saiha	566	8%	172	5%	7	11%	77	3%
Total	7,393	100%	3,364	100%	64	100%	2,201	100%

Source: DHA&V, Mizoram 2014, Quinquennial Livestock

(b) Milk Production

The total milk produced in 2011-12 was 13,950 t; however, the production amount has decreased by 24% and 18% as compared in 2009-10 and 2010-11, respectively, as shown in Figure 4.8.4. The growth of milk production has not been well sustained during this five-year period. The cause for this could mainly be the lack of well-planned improvement of quality of milk from cattle and extension system in Mizoram. In addition, the per capita availability of milk per day in Mizoram was estimated to be 35.23 g, as opposed to the Indian Council of Medical Research's recommendation of 240 g of milk per day per individual. The milk production by district over the five years is shown in Figure 4.8.4. The main milk production area is Aizawl District, followed by Kolasib District, and Lunglei District. However; the milk production growth trend is unstable.

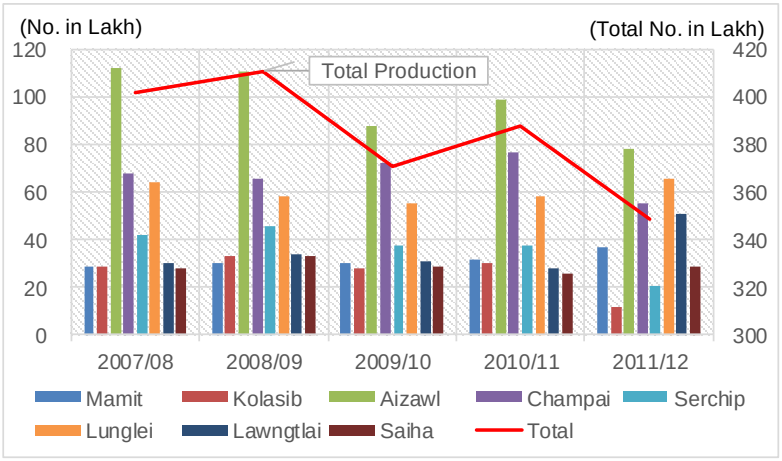


Source: DAH&V, Government of Mizoram

Figure 4.8.4 Progress of Milk Production in Five Years

(c) Egg Production

The total egg production in 2011-12 was 349 lakhs. The total egg production is estimated to have decreased by 11.1% over the previous year, and decreased by 17.8% from 2008-09. The egg production by district in five years is shown in Figure 4.8.5. The main egg production area is Aizawl District, followed by Champhai District, and Lunglei District. The egg production growth trend is also unstable.



Source: DAH&V, Government of Mizoram

Figure 4.8.5 Progress of Egg Production in Five Years

(3) Veterinary Supporting System

(a) Animal Health

The DAH&V has veterinary infrastructure for animal health, i.e., five veterinary hospitals, 35 veterinary dispensaries, and 103 rural animal health posts which provide treatment to animals. The state has nine disease diagnostic laboratories for diagnosing various diseases of livestock. The DAH&V also carry out vaccination of animals free of cost against foot-and-mouth disease, haemorrhagic septicaemia, black quarter, fowl pox, Ranikhet (Newcastle) disease, rabies, and swine fever. All vaccines are procured from West Bengal or Assam as there is no veterinary biological research institute in Mizoram.

(b) Livestock Extension and Capacity Building of Officers

The DAH&V does not have any separate department for livestock extensions cell. However, a senior veterinary officer attached to the Veterinary Information, Extension, Research & Training Division, and other veterinarians attached to other sections are together trying to educate farmers on breeding and nutrition aspects. They are also organising fodder demonstrations, cattle health camps, and clean milk production with relevant printed materials. The budget allocation for extension activities and capacity building is about 0.5% of the total budget of the department. With regard to capacity building of department officers, training is carried out in other states' training institutes. According to the department, the availability of technical manpower for animal husbandry to carry out the development work as well as treatment of animals is adequate. On the other hand, the JICA Study Team received rather negative response from farmers to the performance by the DAH&V through field investigation. The present deployment of animal healthcare services is shown in Table 4.8.8.

Table 4.8.8 Deployment of Institution and Veterinary Personnel (2011-2012)

No.	District	Hospital	Dispensary	Rural Animal Health Centre	No. of AI Centre	No. of Vet. Doctor	No. of *VFA/SVFA/JM etc.
1.	Mamit	0	3	12	0	3	12
2.	Kolasib	1	4	6	8	12	16
3.	Aizawl	1	6	30	16	51	64
4.	Champhai	1	7	13	10	12	21
5.	Serchhip	0	4	7	6	9	25
6.	Lunglei	1	6	26	13	15	41
7.	Lawngtlai	0	2	2	3	3	5
8.	Saiha	1	3	7	2	9	7
Total		**5**	**35**	**103**	**58**	**114**	**191**

Note: VFA: Veterinary Field Assistant, SVFA: Senior Veterinary Field Assistant, JM: Junior Manager*
Source: Department of Animal Husbandry & Veterinary, GOM, 2013

(c) National Animal Disease Reporting System

With the aim of timely reporting, effective monitoring, surveillance and ultimate eradication of disease outbreaks, a centrally sponsored scheme, i.e. "National Animal Disease Reporting System", has been taken up for implementation. The scheme envisages linking of blocks with districts, and districts with the division and state with the Central Monitoring Unit for prompt reporting and feedback. Presently, 36 nodes are available in the state, consisting of two state nodes, eight district nodes, and 26 block nodes, respectively.

4.8.3 Promotion Plan of Livestock Raising

(1) Cattle and Buffalo Development

The GOM does not have any specific breeding policy or specific approach for cattle and buffaloes in Mizoram. However, the Jersey/Holstein-Friesian (HF) breed has been mostly used for crossbreeding of nondescript cows and indigenous descript breeds for upgrading local cows, and the Murrah[3] breed for upgrading local buffaloes in some areas. The state has 32 artificial insemination (AI) centres to provide AI services for cattle and buffaloes. It works out to have one AI unit for every 695 breedable animals as against the norm of one unit per 1,000 breedable animals. The semen is being procured from Hesarghatta, Bangalore. In addition to these, there are 20 private AI workers providing breeding services for cattle. It was observed that 100% of inseminations are with exotic semen (Jersey or HF), and the number of AI done with HF semen is around 73%. The number of AI per calf born is 1.4, which results to 71% conception on calf born basis. The DAH&V has two liquid nitrogen (LN2) plants

[3] Murrah: a breed of domestic water buffalo kept for dairy production. It is originally from Punjab and Haryana states of India

for production and supply of LN2 for maintaining semen doses at the AI centres, and to carry the doses in the field.

(2) Piggery Development

Piggery is one of the most important farming and income sources for farmers, and income generating activity because the demand of pork is very high in Mizoram. About 82% of the total pig population is crossbreds (as of 2012), and the demand for pork is very high in the state. The state's breeding farms provide piglets for rearing and breeding purposes, and additionally to provide training, technical assistance, etc., to farmers. AI in pigs has been initiated at the DAH&V's farm in Selesih, Aizawl District in 2003, and it will be expanded in the 12th Five-Year Plan. The 'Pig Development' scheme under the National Mission for Protein Supplements (NMPS) was implemented during financial year 2012-13 in order to encourage meat production from piggeries.

(3) Poultry Development

Backyard poultry of local birds is very common in the rural areas. The ten existing state poultry farms maintain breeds such as Vanaraja and Grampriya, and supply four to six week pullets to farmers for backyard poultry. Backyard poultry is a subsistence activity wherein eggs and meat are a source of food, and to some extent, periodic cash for households with no additional expenditures in terms of time and capital investment. In order to increase the production of eggs and meat, the poultry farms and hatcheries which produce chicks should be maintained, chicks and feeds should be supplied to farmers at reasonably lower costs, and existing departmental poultry farms should be designated as commercial/production farm by injecting financial input to upgrade and augment the facilities for further sustainable development.

(4) Dairy Sector

The current milk production of the state is 139.5 lakh L per annum, and of which 155 lakh L is the marketable surplus. The Mizoram Multi-Commodity Producers Cooperative Union (MULCO) is involved in the procurement and marketing of milk and dairy products. There are 76 dairy cooperative societies, of which 72 are functional, with a total membership of 1,520. The union has a dairy plant in Aizwal with a capacity to handle 15,000 L per day (LPD), and is operating around 50% capacity. In addition to this, there are three more dairy plants of 15,000 LPD capacity, and 11 chilling centres of 500 L capacity. The milk price structure is not controlled by the state government. Presently, the dairy plants are paying Rs.22-24 per L of milk with 4% fat and 8.5% SNF.

The dairy plants process their milk and market homogenized milk in Mizoram through agents and a few retail outlets.

(5) Institutional Arrangement

DoAD, MULCO and the Pig Producers Cooperative Federation are the institutions working for livestock development in Mizoram. These institutions have proper convergence and coordination among their activities and roles. Aside from these organisations, veterinary colleges, KVKs, and private sector organisations are also involved in promoting the livestock sector in the state.

(6) Other Livestock Development

The DAH&V has been assisting other livestock development such as rabbit, sheep and goat development. These livestock contribute to meat production. In the 12th Five-Year Plan, goat farming was proposed to be strengthened. The scheme envisaged identification and selection/adoption of villages throughout Mizoram, and from each village, families will be selected and rear not less than 50 goat/sheep.

(7) Feed and Fodder Development

Mizoram has a shortage of concentrate feeds for daily cattle, poultry and pig, and a major source of feeds are from outside the state at high costs. The DAH&V envisages rendering assistance to farmers by provision of feed price support and transport subsidy. In addition to this, establishment of grazing grounds will be promoted in villages throughout Mizoram, and will rear at least 20 mithun/hill cattle by each selected farmer in the 12th Five-Year Plan.

(8) Biogas Development

The DAH&V has been a nodal agency for the National Biogas and Manure Management Programme since 1982. The main activity is installation of biogas plants to farmers for maximising the utility of their livestock and by-products in order to obtain lighting and cooking fuel, organic manure, and also permanent sanitary fitting in rural areas. It will be continued in the 12th Five-Year Plan. The results of distribution of biogas plants showed 462 biogas plants in total by 2012, as shown in Table 4.8.9

Table 4.8.9 Results of Distribution of Biogas

District	Provided No. of Biogas per Family	Average No. of Cattle Rearing per Farmer	Average No. of Family Members
Mamit	5	8.2	5.2
Kolasib	20	9.3	5.6
Aizawl	392	9.7	6.0
Champai	10	9.6	6.2
Serchip	15	9.4	6.1
Lunglei	10	9.6	6.2
Lawngtlai	5	7.4	5.2
Saiha	5	8.0	5.4
Total / Average	**462**	**9.6**	**5.9**

Source: DOA&V,2013 Government of Mizoram

4.8.4 Implementation and Progress of NLUP

(1) Components of the NLUP

Table 4.8.10 shows the project packages/trade adopted to the livestock subsector. Farmers could choose the most suitable one from the six options, as shown in Table 4.8.10, in relation to market opportunities, etc., and assistance was given in kind or cash by the DAH&V. Each project includes construction cost of stall, poultry house, other necessary facilities/tools, and feeds to assure their first income for farmers to achieve sustainable income generation.

Table 4.8.10 Estimated Project Unit Cost and Estimated Income of Livestock Development for Farmers

No.	Project Package / Trade	Project Size	Beneficiary's Contribution	Unit Project Cost (Rs.)	Gross Income for the First Year (Rs.)	Expenditure for the First Year (Rs./year)	Estimated Income (Rs./year)
1	Dairy Cow Farming	2 Crossbred Cows	20%	138,600	140,000	28,100	111,900
2	Pig Rearing	2 Sows and 5 Fatteners	20%	99,897	117,000	30,880	86,120
3	Mithun/Hill Cattle Rearing	9 Female and 1 Male	20%	99,750	192,000	73,000	119,000
4	Poultry Farming (Layer)	150 Layer	20%	99,839	135,000	49,635	85,365
5	Poultry Farming (Broiler)	200 Broiler	20%	97,440	86,400	35,200	51,200
6	Goat/Sheep Rearing	48 Female and 2 Male	20%	99,750	60,000	3,000	57,000

Source: NLUP Achievement, DAH&V, Government of Mizoram

Apart from project packages, the infrastructure components were planned as shown in Table 4.8.11

(2) Progress and Constraints

Following project packages for dairy, piggery, mithun, and poultry (layer and broiler) have been implemented by the DAH&V from 2010-11 to 2013-14. More than 50% of beneficiaries have chosen piggery farming, while only 5% have chosen daily cow farming, as shown in Table 4.8.12.

Table 4.8.11 Infrastructure Development Components

No.	Components	Fund (Rs. in lakhs)
1	Feed Production	57.80
2	Poultry Development (Government)	20.00
3	Poultry Development (Private)	10.00
4	Piglet Production (Government)	40.00
5	Piglet Production (PIGFED)	20.00
6	Piglet Production (Private)	160.00
7	Milk Marketing	89.73
8	Training and manpower	26.47
9	Vaccines and Medicines	18.00
Total		442.00

Source: NLUP Achievement: Department of Animal Husbandry & Veterinary, Mizoram

Table 4.8.12 Progress of NLUP under the DAH&V

Trade	Phase	1st	(%)	2nd	(%)	3rd	(%)	4th	(%)	Total / Ave	(%)
Daily	No. of Beneficiaries	949	10	466	4	254	3	134	3	1,803	5
	Unit of Fund (Rs. '000)	26.3	-	27.7	-	100.0	-	100.0	-	63.5	-
	Disbursed Fund (Rs. '000)	24,945	3	12,885	3	25,400	3	13,400	3	76,630	3
Piggery	No. of Beneficiaries	5,347	54	7,162	55	5,453	57	2,753	58	20,715	56
	Unit of Fund (Rs. '000)	100	-	35	-	100	-	100	-	84	-
	Disbursed Fund (Rs. '000)	534,700	58	250,670	56	545,300	57	275,300	58	1,605,970	57
Poultry	No. of Beneficiaries	1,778	18	4,379	33	603	6	327	7	7,087	19
	Unit of Fund (Rs. '000)	100	-	35	-	100	-	100	-	84	-
	Disbursed Fund (Rs. '000)	177,800	19	151,076	34	60,300	6	32,700	7	421,876	15
Mithun	No. of Beneficiaries	1,856	19	1,085	8	3,226	34	1,495	32	7,662	21
	Unit of Fund (Rs. '000)	100	-	29	-	100	-	100	-	82	-
	Disbursed Fund (Rs. '000)	185,600	20	31,031	7	322,600	34	149,500	32	688,731	25
Total No. of Beneficiaries		9,930	100	13,092	100	9,536	100	4,709	100	37,267	100
Total: Disbursed Fund (Rs. '000)		923,045	100	445,662	100	953,600	100	470,900	100	2,793,207	100

Note: 1st phase (2010-11, 2011-12), 2nd phase (2012-13, 2013-14), 3rd phase (2012-13, 2013-14) and 4th phase (2012-2014)
Source: NLUP Achievement, DAH&V, Government of Mizoram

During the implementation of NLUP, the following problems have been pointed out by the department:

i) Procurement of piglets: piglet multiplication centres were established to produce more piglets, however, due to the outbreak of porcine reproductive and respiratory syndrome (PRRS), many piglets and breeding sows died.
ii) Procurement of dairy cattle: delayed in distribution of dairy cows to the beneficiaries.
iii) Animal insurance: in the case of dairy cows, insurance was covered. But no insurance company was willing to take up insurance for pigs.
iv) Feed and fodder: there are no surplus grains for animal feeds in Mizoram, and fodder is also insufficient. In addition it was difficult to purchase high concentrate animal feeds for farmers without any subsidy.
v) Training: adequate training programmes could not be implemented due to shortage of funds.
vi) Fund release: there are delays in releasing funds to beneficiaries in non-banking areas due to insufficient cash of banks.

4.8.5 Problems and Constraints for Development

(1) Profitable Livestock Management

One of the major constraints in livestock production is the lack of orientation/education and awareness among the farmers about the potential of livestock as an income generation activity, along with a strategic livestock development plan shared with farmers. In addition, there is an overall shortage of nutritional feeds, and as a result, more than 90% of feed ingredients are imported from outside the state. The high cost of feeds and fodder arising from shortage is another major constraint to income generation from livestock activities. It is necessary to take action on farmers with no interest or intention to continue or develop livestock farming beyond a self-sufficient level without certain management knowledge and techniques.

(2) Dairy Development

Besides a sizeable milk production from the private sector, the state government has implemented four dairy development projects initiated under the centrally sponsored scheme 'Intensive Dairy Development Project' (IDDP). The two dairy plants in Aizawl and Champhai respectively have been handed over to the union at the district level, and the other two projects in Lunglei and Kolasib respectively are being maintained by the state government. Milk of 8,750-11,250 L per day is being marketed through this scheme, in contrast to the plant capacity of 30,000 L per day. In spite of an estimated availability of 11,427 t of milk, there was still a demand gap of 86,339 t of milk in 2010-11 as per the requirement recommended by ICMR.

4.9 Sericulture

4.9.1 Policy

India is a unique country producing all four known types of silk, namely: domesticated Mulberry silk, semi-domesticated Eri silk, wild Tasar silk, and exclusive Muga silk, which is the wild golden silk unique to India. Sericulture is a labour intensive industry in all its phases with employment generation of about 7.65 million persons per annum. Since the Labour Force Participation Rate (LFPR) in sericulture is far ahead in comparison with similar rural agriculture and industries, it has significantly contributed to poverty alleviation thereby achieving the national agenda of inclusive development.

The policies of sericulture development both at the national and state levels are described as follows:

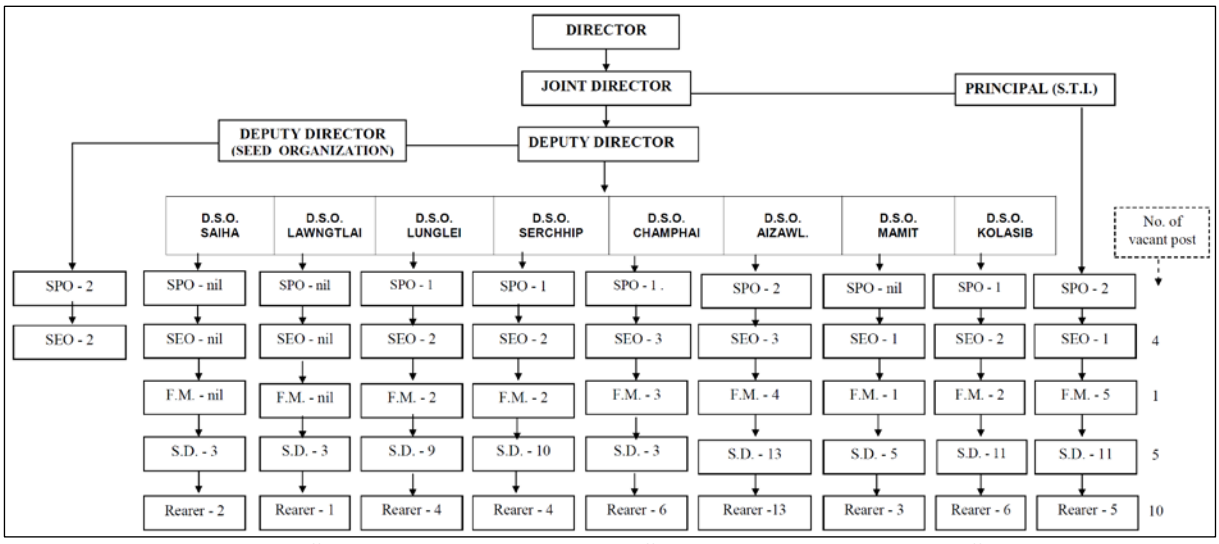
- To create greater opportunities for gainful employment and improved levels of income through sericulture in the state.
- To make continuous efforts in research and development and technology transfer.
- To improve productivity in all stages of silk production at the national level.
- To devise means for improved methods of mulberry cultivation, silkworm rearing, developing and distribution of healthy silkworm seeds, improved methods of silk reeling and spinning of the cocoons and silk waste, and improving the quality and production of raw silk.

4.9.2 Organisation

(1) National Level

The Central Silk Board (CSB) is a statutory body under the Ministry of Textiles, Government of India. The headquarters is located at Bangalore. CSB is the apex body for overall development of sericulture and silk industry in India. The functions assigned to the board are to promote development of the silk industry by all appropriate measures like undertaking, assisting, and encouraging scientific, technological, and economic research, improvement of mulberry cultivation, production and distribution of healthy silkworm seed, production of quality raw silk, and promotion of silk market. In addition, the board is responsible for advising and reporting to the Government of India on all matters relating to the development of the raw silk industry, including the import and export of raw silk.

(2) State Level



Note: DSO = District Sericulture Officer; SPO = Sericulture Promotion Officer; SEO = Sericulture Extension Officer;
F.M.= Farm Manager; S.D. = Sericulture Demonstrator
Source: Department of Sericulture, Government of Mizoram

Figure 4.9.1 Organisational Set Up of DOS as of 1 November 2013

The Department of Sericulture (DOS) was created in 1985 by the Government of Mizoram to achieve several objectives such as to uplift the rural economy in the state, to generate gainful direct and

indirect employment, and at large to do away with the devastating Jhum cultivation in the state through cultivation of silkworm food plants for the production of commercial cocoons.

The DOS is functioning under the control of the Director of Sericulture, Government of Mizoram. At present, there are 264 personnel employed in DOS as shown in Table 4.9.1.

Table 4.9.1 Staff Number of Sericulture Department

District	Staff (Nos.)	
	Technical	Non-Technical
Directorate	8	31
Mamit	11	4
Kolasib	23	8
Aizawl	36	14
Champhai	17	5
Serchhip	20	3
Lunglei	19	9
Lawngtlai	5	1
Saiha	6	4
Sericulture Training Institute (STI)	25	15
Total	**170**	**94**
Grand Total	264	

Source: Department of Sericulture, Government of Mizoram

Table 4.9.2 Education Level of Staff

Educational Level	Staff Number
PhD	-
MSc/PGDS	24
MBA/HDCM(COOP)	1
University/ College Graduate	22
High School Graduate	50

Source: Department of Sericulture, Government of Mizoram

4.9.3 Plan for Sericulture Development

(1) 12th Five-Year Plan

During the 12th Plan period (2012-2017), the increase in production of bivoltine Mulberry silk and also Eri and Muga sectors shall be given importance simultaneously by the DOS in the state of Mizoram. To meet these ends, the maximum quantity of high yielding Mulberry variety, Som/ Soalu and Castor/ Kesseru shall be introduced in the private sectors. In the meantime, seed grainages, rearing and post cocoon technologies shall be upgraded as far as practicable.

The following are the major continuing schemes on sericulture to be implemented in the 12th Plan period.

Table 4.9.3 Major Schemes Implemented by the Department of Sericulture in the 12th Plan Period

Scheme	Financial Target	Contents/ Activities
Direction	Rs.1,052 lakhs	・ Strengthening of directorate administration, planning and implementation, monitoring of all work activities, and financial control to overall control of sanction expenditures.
Administration	Rs.2,780 lakhs	・ Maintenance and upkeep of all district offices. ・ Maintenance of all seed farms and centres. ・ Production of cocoons and raw silk will be 500 t and 50 t, respectively. ・ Creation of posts is also proposed as per necessity.
Promotion	Rs.1,088 lakhs	・ Technical assistance is provided to the registered farmers from time to time as extension and promotional activities at village level. ・ Various catalytic development projects sponsored by the Central Silk Board are incorporated under this scheme for promotional upgrading of Mulberry, Eri, Muga, Oak Tasar and post cocoon activities.
Sericulture Marketing	Rs.1,072 lakhs	・ Measures to establish an appropriate marketing system will be considered and implemented because the marketing of the produce of the farmers has been directly handled by the government department.
Research and Training	Rs.253 lakhs	・ Research and training institute at Zemabawk will be entrusted to work on plant protection and plant and animal pathology so as to eradicate various dreadful diseases of food plants and silkworms.
Silk Processing	Rs.587 lakhs	・ To create and encourage private reelers/weavers so as to sustain their livelihood through sales of their products.
Seed Organisation	Rs.587 lakhs	・ To organise standard seed organisation for producing sufficient healthy silkworm eggs to meet the requirement of the farmers.

Source: Department of Sericulture, Government of Mizoram

(2) National Project / Programme

The following national projects and programmes are also implemented to develop sericulture in the state of Mizoram.

Table 4.9.4 Ongoing National Project/ Programme for Sericulture Development

Title	Sponsored by	Period	Outline of Project / Programme
Catalytic Development Programme	CSS/ Central Silk Board	2007-2012 2012-2017	・ Programme for the development of Eri, Muga, Oak Tasar, and Mulberry silk in Mizoram under CDP ・ Components: i) Assistance to seed rearers, ii) Raising of plantation, iii) Construction of rearing infrastructures, iv) Supply of rearing appliances/ farm equipment, v) Support for silk reeling and spinning, vi) Providing of support services (publicity for the sector)
Rashtriya Krishi Vikas Yojana (RKVY)	CSS	2012-2013 2013-2014	・ Projects for the development of Muga, Mulberry, and Eri silk in Mizoram under RKVY programme ・ Components: i) Land development, ii) Raising of plantation, iii) Construction of rearing infrastructures, iv) Post cocoons development

Source: Department of Sericulture, Government of Mizoram

4.9.4 Implementation and Progress of NLUP

(1) Overall Programme to be Implemented with Expenditure

The phase-wise fund allocation for the implementation of NLUP is shown in Table 4.9.5.

Table 4.9.5 Fund Allocated for Sericulture on NLUP Implementation

Phase	Year	Fund Received (Rs. in lakhs)			Expenditure (Rs. in lakhs)
		CSS	ACA	Total	
1st Phase	2010 – 12	208.8	620	828.8	828.8
2nd Phase	2012 – 13	240.77	856	1096.77	632
3rd Phase	2013 – 14				24.2
4th Phase	2013 – 14	-	-	-	8.2
Total		**449.57**	**1,476**	**1,925.57**	**1,493.2**

Source: Department of Sericulture, Government of Mizoram

(2) Performance and Progress of DOS's Programme Achieved so far

The total target for sericulture on NLUP implementation was 8,500 beneficiaries in five years. Of these, only 826 beneficiaries had been covered during the 1st phase and 1,096 beneficiaries had been covered during the 2nd phase.

Table 4.9.6 District-wise Beneficiaries of Sericulture on NLUP Implementation

Name of District	1st Phase	2nd Phase	3rd Phase	4th Phase
Aizawl District	282	341	98	34
Lunglei District	145	162	42	18
Champhai District	186	113	15	14
Kolasib District	33	153	10	6
Serchhip District	65	123	19	4
Mamit District	70	34	10	3
Saiha District	43	88	27	7
Lawngtlai District	2	44	12	3
Total	**826**	**1,058**	**233**	**89**
Ground Total	**2,206**			

Source: Department of Sericulture, Government of Mizoram

By using the fund received from NLUP for infrastructure development, the following infrastructures have been developed:

Table 4.9.7 Infrastructure Development for Sericulture under NLUP

Infrastructure	Location
Grainage Building	Zemabawk/ Aizawl District
Cold Storage	Zemabawk/ Aizawl District
Solar Power Plant	Zemabawk/ Aizawl District
Rearing House	Champhai and Serchhip
Cocoon Godown	Rotlang 'E' and Changpui/ Lunglei District
Farmers Training Hall	Zobawk/ Aizawl District

Source: Department of Sericulture, Government of Mizoram

4.9.5 Current Situation of Sericulture[1]

(1) Type and Method of Sericulture

The state of Mizoram has been proven to be an ideal place for the development of sericulture industry. The climatic condition, rainfall, and fertility of the soil are suitable for cultivation of silkworm food plants and rearing of silkworms of all types like Mulberry, Eri, Muga, and Oak Tasar.

(a) Mulberry

Mulberry can be grown under various climatic conditions, ranging from temperate and tropical conditions. The soil and climatic conditions of Mizoram are ideal for luxuriant growth of Mulberry and rearing of silkworms throughout the year. Mulberry silkworms (*Bombyx mori*) reared in the state are bivoltine and crossbreed. Mulberry belongs to the genus *Morus*. The plant is a perennial one, living for a number of years either cultivated or in wild state. Depending on the method of cultivation, the plant is grown as a bush, tree, or a middling. Mulberry is a deep-rooted plant; the soil should be capable of supplying sufficient air, water, and nutrients even at a deeper layer up to where the root system penetrates. Therefore, soils of Mulberry gardens should be fertile, deep, friable, clayey loam to loamy in texture and porous with good water holding capacity. Slightly acidic pH (ranges 6.2- 6.8 pH) soils are ideal for good growth of Mulberry.

The following Table 4.9.8 shows the work calendar of Mulberry plantation for silkworm rearing under NLUP.

Table 4.9.8 Work Calendar of Mulberry Plantation for Silkworm Rearing under NLUP (2013-2014)

Component	Unit	Rate (Rs.)	Quantity	Amount (Rs.)		
				Govt. Assistance (80%)	Beneficiary Contribution (20%)	Total
1st Installment						
Jungle Clearance (man-days)	No.	132	47	5000.00	1250.00	6250.00
Preparation of Land (man-days)	No.	132	53	5560.00	1390.00	6950.00
Cost of Manure	LS	-	-	992.00	248.00	1240.00
Pit digging	No.	132	80	8448.00	2112.00	10560.00
Subtotal				**20000.00**	**5000.00**	**25000.00**
2nd Installment						
Pit Digging	No.	132	20	2112.00	528.00	2640.00
Cost of Manure	LS	-	-	2448.00	612.00	3060.00
Cost of Mulberry Cutting at 4x4 spacing	No.	0.35	7000	1960.00	490.00	2450.00
Application of Manure	No.	132	20	2112.00	528.00	2640.00
Planting of Cuttings	No.	132	80	8448.00	2112.00	10560.00
Two Times Weeding	No.	132	80	8448.00	2112.00	10560.00
Subtotal				***25528.00***	***6382.00***	***31910.00***

[1] Although several data for the last five years have been acquired from the state government, there is quite big gap between the data in 2011-2012 and data in 2012-2013. As a result, only the data for 2012-2013 were used on sericulture in this report.

Component	Unit	Rate (Rs.)	Quantity	Amount (Rs.)		
				Govt. Assistance (80%)	Beneficiary Contribution (20%)	Total
Total for 1st Year				**45528.00**	**11382.00**	**56910.00**
3rd Installment						
Two Times Weeding	No.	132	80	8448.00	2112.00	10560.00
Construction of Rearing House Assam Type, 24' x 15'	No.	35000	1	28000.00	7000.00	35000.00
Subtotal				***36448.00***	***9112.00***	***45560.00***
4th Installment						
Supply of Rearing Equipment/ Appliances	-	LS	LS	18024.00	4506.00	22530.00
Subtotal				***18024.00***	***4506.00***	***22530.00***
Total for 2nd Year				***54472.00***	***13618.00***	***68090.00***
Grand Total				**100000.00**	**25000.00**	**125000.00**

Source: Department of Sericulture, Government of Mizoram

(b) Eri

Eri silk or the silk of the castor silkworm is produced by *Philosomia ricini*. Assam in India is the home of the Eri silk industry. The hilly tracks and rich forests of the northeastern region are experiencing heavy rainfall and eminent humidity suitable for Eri culture. Eri silkworm is multivoltine and polyphagous in nature, feeding on a number of host plants, viz, Castors (*Ricinus communis*), Kesseru (*Heteropanax fragrans*), Tapioca (*Manihot esculanta*), and many others but the Eri worms feed mainly on Castor plants. Kesseru ranks second among all the food plants of Eri silkworm.

(c) Muga

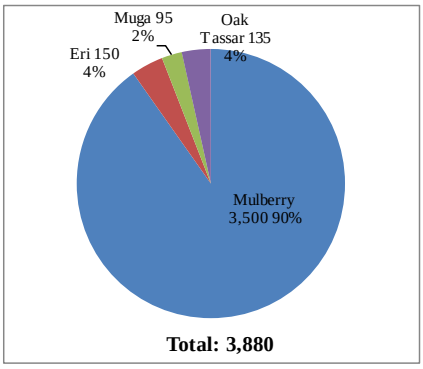
Muga silkworm (*Antheraea assamensis*) is a polyphagous, multivoltine insect and feeds on a wide range of host plants. Som (*Machillus bombycina*) and Soalu (*Litsea polyantha*) are the primary food plants of Muga silkworm whereas Dighloti (*Litsea salicifolia*) and Mejankosi (*Litsea citrate*) are the secondary host plants. Muga has vast demand in national and international market due to its unique quality. Muga silk is lustrous, highly durable, the strongest and toughest of all natural silks, and considered as Assam's costliest silk and the industry's money spinner. Among the wild silks, Muga has a special status due to its golden yellow natural shine. Muga culture is practiced indigenously in the northeastern region of India, especially Assam and Meghalaya.

(d) Oak Tasar

Tasar culture is a forest-based industry uniquely suited to the economy and social structure of developing countries because of its minimum investment requirement, high employment and foreign exchange earning potential. The Tasar silkworm of Mizoram belongs to the species *Antheraea proylei* which feeds on Oak tree (*Quercus*). The insect is normally bivoltine which can be reared twice in a year. However, the food plants in general come up well on almost all types of soils. It has been estimated that over 30,000 ha of natural grown Oak Tasar trees are available in the northeastern part of the states.

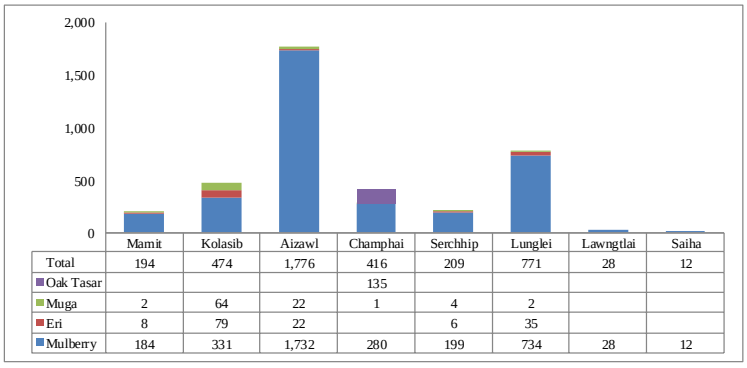
(2) Sericulture Farmers

There are 3,880 farmers involved in sericulture in Mizoram, of which 90% are engaged in Mulberry sector, followed by Eri at 4%, Oak Tasar at 4%, and Muga at 2% in 2012-13 (Figure 4.9.2). The number of farmers is high in Aizawl District (46%), followed by Lunglei, Kolasib, Champhai, and Mamit. Quite few numbers are shown in Lawngtlai and Saiha districts (Figure 4.9.2). Oak Tasar sector is concentrated only in Champhai District.



Source: Sericulture Profile of Mizoram and Status for 2012-13, Department of Sericulture, Government of Mizoram

Figure 4.9.2 Farmers Involved in Sericulture in Mizoram, 2012-13



	Mamit	Kolasib	Aizawl	Champhai	Serchhip	Lunglei	Lawngtlai	Saiha
Total	194	474	1,776	416	209	771	28	12
Oak Tasar				135				
Muga	2	64	22	1	4	2		
Eri	8	79	22		6	35		
Mulberry	184	331	1,732	280	199	734	28	12

Source: Sericulture Profile of Mizoram and Status for 2012-13, Department of Sericulture, Government of Mizoram

Figure 4.9.3 District-wise Sericulture Farmers in Mizoram, 2012-13

(3) Production of Cocoon and Raw Silk

The statistics related to productive area under silkworm food plant, consumption of disease free layings (Dfls), production of reeling cocoons, production of raw silk, cocoon productivity, and raw silk productivity in Mizoram are shown in Table 4.9.9. Productivity of Mulberry cocoon per Dfls is 43.8 kg in Mizoram. It is low compared with the national average productivity of 60.0 kg in 2007. Productivity of Mulberry raw silk per area of silkworm food plant is also very low, average productivity of national and Mizoram are 90.9 kg/ha (2011-12) and 15.9 kg/ha, respectively.

Table 4.9.9 Area of Silkworm Food Plant, Consumption of Dfls, Production of Reeling Cocoon, Production of Raw Silk, and Productivities of Cocoon and Raw Silk in Mizoram, 2012-13

Sector	Area of Food Plant (ha): (A)	Dfls (nos.)	Cocoon Production	Raw Silk Production (kg): (B)	Cocoon Productivity (kg/100 Dfls)	Raw Silk Productivity (kg/ ha) : (B/A)
Mulberry	1,864	685,000	300,000 kg	29,670	43.8	15.9
				National Average	**60.0**	**90.9**
Eri	280	67,200	7,100 kg	5,400	25.4	19.3
Muga	186	116,000	1,392,000 nos	323		1.7
Oak Tasar	80	30,000	118,000 nos	19		0.2

Source: Sericulture Profile of Mizoram and Status for 2012-13, Department of Sericulture, Government of Mizoram

(4) Marketing of Cocoon and Silk

Producers bring their cocoons to the consolidating points predetermined by each district office of DOS. As a protocol, only one cargo truck of DOS collects these cocoons, and cash payment is made at the time of pickup by the officer. Collected cocoons are transported to the reeling centre operated by the DOS. There is no private reeling factory in the state of Mizoram. Raw silks are sold to private weavers in and out of the state.

Table 4.9.10 shows the prevailing market prices of reeling cocoon and raw silk.

Table 4.9.10 Market Prices of Reeling Cocoon and Raw Silk

Mulberry Raw Silk (Price in: Rs./kg)		
Year	**Reeling Cocoon (Bivoltine/Crossbreed)**	**Raw silk**
2011-12	100-180	700-1500
2012-13	120-200	700-1500
Oak Tasar (Price in: Rs./1000 nos. and kg)		
Year	**Reeling Cocoon (1000 nos.)**	**Raw silk**

2011-12	400	1500-3000
2012-13	450	1500-3000
Muga (Price in: Rs./1000 nos. and kg)		
Year	**Reeling Cocoon (1000 nos.)**	**Raw silk**
2011-2012	400	1500-3000
2012-2013	954	2000-4000
Eri (Price in: Rs./1000 nos. and kg)		
Year	**Reeling Cocoon (1000 nos.)**	**Raw silk**
2011-2012	200	500-700
2012-2013	250	500-700

Source: Sericulture Profile of Mizoram and Status for 2011-12 and 2012-13, Department of Sericulture, Government of Mizoram

4.9.6 Problems and Constraints for Development

(1) Problems Being Faced by the State

- Prevalence of low yielding varieties of Mulberry.
- Lack of irrigation facilities and shortage of fertilizers.
- Inadequate supply of quality silkworm seed for Mulberry, Muga and Eri.
- Inadequate support for conversion of cocoons into quality yarn adopting improved devices.
- Lack of adequate transport facilities and power.
- Lack of organised marketing system for silk commodities.
- Need for training for human resource development both in non-farm and on-farm sectors.

(2) Issues to be Sorted out Between CSB and State

- Settlement of Dfls Cost Balance (DCB) arrears.
- Implementation of Silkworm Seed Regulation Act 2010.
- Constitution of silkworm seed production monitoring body in collaboration with the northeastern states.

(3) Research and Development Issues

- Exploration and conservation of wild Muga, Eri, Mulberry and Oak Tasar fauna and flora and evolving new breeds.
- Evolving package of practices for control of diseases.
- Devising a technology for increasing silk recovery, improvement of yarn quality, and opening of Eri cocoon for extraction of pupa.

(4) Seed Production and Supply

- Timely submission of season-wise indent for Mulberry, Muga, Eri and Oak Tasar silkworm seed.
- Involvement of public participation in basic and commercial Dfls production.

Interlinking of infrastructure resources of the state for seed multiplication and production.

4.10 Forest Conservation and Forest Products

4.10.1 Policy, Institution, and Plan

(1) National Level

The Ministry of Environment and Forests, Government of India, is the nodal agency responsible for conserving forests in India. Its forest conservation policy is based on the Indian Forest Act, 1927 and the National Forest Policy, 1988. Table 4.10.1 shows the national laws and regulations on environment protection and forest conservation.

Table 4.10.1 National Laws and Regulations on Environmental Protection and Forest Conservation

Title of Laws and Regulation	Date Enacted	Outline
1. The Forest Conservation Act, 1980	25 October 1980	Forest Conservation Act is an act to provide for the conservation of forests and for matters connected with protection of trees from illegal felling and destruction. This act covers all aspects of forests including reserve forests, protected forests or any forestlands irrespective of ownership. There are five main clauses in the act which guides the use of forest resources and limit the harm to forest reserves.
2. The Wildlife (Conservation) Act, 1972 (as amended up to 2006)	9 September 1972	The act provides for the protection of wild animals, birds and plants, having six schedules, which give varying degrees of protection.
3. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition and Forest Right) Act, 2006	31 December 2007	The act is to protect the right of the tribes having forest products for their living. The act has two functions, namely: granting legal recognition to the rights of traditional forest dwelling communities and giving communities and the public a voice in forest and wildlife conservation.

Source: Environment and Forest Department

The National Forest Commission, set up in 2003, reviewed the policy, legislative and institutional basis of forest management comprehensively. However, the ministry recognises the necessity to take some further steps, looking to some of the underlying causes of forest loss. In summary, these are to:

i) Give legal recognition of the traditional entitlements of forest dependent communities, resulting in reducing possibilities of conflict with the forest department and providing long-term incentives to communities to conserve the forests;
ii) Formulate an innovative strategy for an increase in forest and tree cover from the 2003 level of 23.69% to 33% in 2012;
iii) Formulate an appropriate methodology for reckoning and restoring the environmental values of forests, which are unavoidably diverted to other uses;
iv) Formulate and implement a “Code of Best Management Practices” for dense natural forests, to realise the objective and principles of the National Environment Policy, 1992;
v) Denotify bamboo and other similar species as ‘forest species’ under the Forest Conservation Act, to facilitate their cultivation outside notified forests, and encourage their productive utilisation in economic activities; and
vi) Promote plantation of only such species, which are conducive to the conservation and sustainability of given ecosystems.

(2) State Level

The Environment and Forest Department (EFD) is the responsible body for conserving the forest in the state and overseeing forest products. The policy of EFD is to achieve well-stocked high-quality forests with rich biodiversity for maintaining ecological balance and ensuring environmental stability while meeting the forest-based needs of the local people. The state's laws and regulations governing environment protection and forest conservation are as follows:

i) The Mizoram Forest Act, 1955;
ii) The Mizoram Forest Produce Mahal Rules, 2002;

iii) The Mizoram Establishment and Regulation of Saw Mills and Other Wood Based Industries Rule, 2010;
iv) The Mizoram State Biological Diversity Rules, 2010; and
v) Guidelines for Felling of Trees from Non-forest Areas, 2002

With the above policies, laws and regulations, EFD undertakes measures to increase the area under forest cover and enhance the quality of existing forests through [1] application of the principles of sustainable management, [2] adoption of effective silviculture practices, and [3] involvement of the local people in planning, implementation, and monitoring of schemes for conservation of the forests and wildlife.

In particular, joint forest management (JFM) is the main thrust in forest conservation undertaking, involving people's participation. The introduction of JFM established a new, mutually beneficial relationship among the forests, the people, and the state, resulting in encouraging active involvement of the local people in enrichment, protection, and sustainable management of the forests.

(3) Organisation of EFD and Staff

EFD is led by the Principal Chief Conservator of Forests and has three organisational cells each headed by the Chief Conservator of Forests, Planning and Development, and Administration and Wildlife, respectively. The organisations in the field level under the Chief Conservator of Forests are divided into four circles which look after the northern, southern, and central region, and research & development section. The EFD's organisational chart is shown in Figure 4.10..

EFD has 885 service personnel in total from the department's headquarter and regional offices. Table 4.10.2 shows the post-wise personnel distribution, centrally and regionally, and Table 4.10.3 shows the educational level of the service personnel.

Table 4.10.2 EDF's Post-wise Personnel Distribution (as of November 2013)

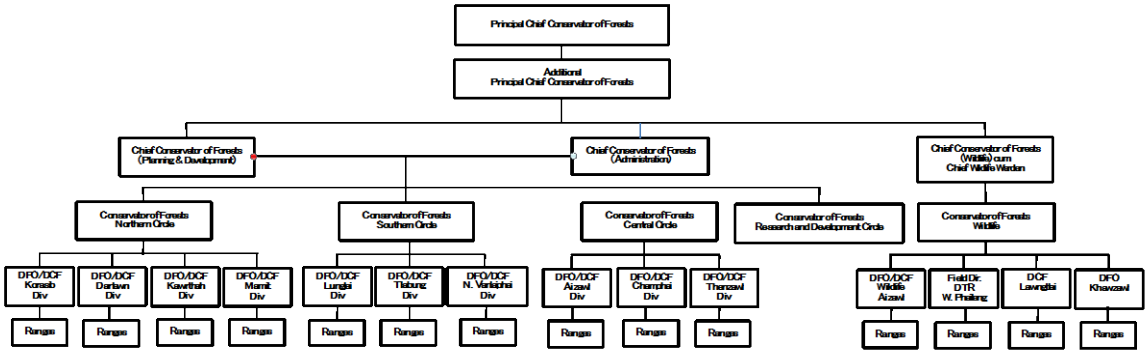
Post	Department H/Q	Regional Office	Total
Management Official	15	27	42
Management Staff	18	17	35
Forest Ranger	2	57	59
Working and Supporting Staff	161	588	749
Total	197	688	885

Source: Environment and Forest Department

Table 4.10.3 Educational Level of EFD Service Personnel

Education Level	Department H/Q	Regional Office	Total
M. Sc /B. Sc	15	27	42
University/College Graduate	20	36	56
Higher School Graduate	9	78	87
High School Graduate	30	225	255
Total	74	366	440

Source: Environment and Forest Department



Source: Environment and Forest Department

Figure 4.10.1 Organisational Chart of Environment and Forest Department

4.10.2 Overview of Forest Conservation and Land Use Potential

(1) Historical Forest Status

Forest Survey of India (FSI) is a national organization responsible for the assessment and monitoring of forest resources under the Ministry of Environment and Forests of India. It conducts national forest survey regularly. The survey reports titled "India State of Forest Report" were available since 1987, and for the past decade, they were issued in 2001, 2003, 2005, 2009, and 2011. The historical forest statuses in Mizoram in 2001, 2005, and 2011 are indicated in Table 4.10.4.

Table 4.10.4 Historical Transition of Forest in Mizoram

Description	Year 2001	Year 2005	Year 2011
Recorded forest area (km^2)	15,935	16,717	16,717
(% to state land)	(75.6%)	(79.3%)	(79.3%)
- Reserved forest (km^2)	7,127	7,909	7,909
- Protected forest (km^2)	3,568	3,568	3,568
- Unclassed forest (km^2)	5,240	5,240	5,240
Forest cover (km^2)	17,484	18,684	19,117
(% to state land)	(82.9%)	(88.6%)	(90.7%)
- Very dense forest (km^2)		133	134
- Moderately dense forest (km^2)	8,936	6,173	6,086
- Open forest (km^2)	8,558	12,378	12,897

Source: India State of Forest Reports 2001, 2005 and 2011
Note: Terms related to forest as tabulated above defined in India are as follows:
Recorded forest area : Area recorded as a forest in the government record:
Reserved forest : An area so constituted under the provision of the Indian Forest Act or other State Forest Acts, having full degree of protection, in which all activities are prohibited unless permitted;
Protected forest: An area notified under the provisions of the Indian Forest Act or other State Forest Acts, having limited degree of protection, in which all activities are permitted unless prohibited;
Unclassed forest: An area recorded as forest but not included in reserved or protected forest category. Ownership status of such forests varies from state to state;
Forest cover: All lands, more than one hectare in area, with a tree canopy density of more than 10% irrespective of ownership and legal status. Such lands may not necessary be a recorded forest area. It also includes orchards, bamboo and palm;
Very dense forest: Lands with forest cover having a canopy density of 70% and above;
Moderately dense forest : Lands with forest cover having a canopy density between 40% and 70%; and
Open forest : Lands with forest cover having a canopy density between 10% and 40%.

The district-wise forest covers in different canopy density classes along with the changes compared with 2005 assessment are given in Table 4.10.5

Table 4.10.5 District-wise Forest Cover

District	Geographical Area, GA (km^2)	2011 Assessment (km^2)				Percent of GA (%)	Change from 2005 (km^2)
		Very dense	Moderately dense	Open forest	Total		
Mamit	3,025	45	697	2,032	2,774	91.70	+ 131
Kolasib	1,382	0	175	1,046	1,221	88.35	- 45
Aizawl	3,575	26	1,205	2,034	3,265	91.33	+ 108
Champhai	3,185	57	1,096	1,632	2,785	87.44	+ 181
Serchhip	1,421	5	408	794	1,207	84.94	+ 130
Lunglei	4,536	1	1,233	2,972	4,206	92.72	- 55
Lawngtlai	2,557	0	704	1,664	2,368	92.61	+ 37
Saiha	1,400	0	568	723	1,291	92.21	- 54
Total 2011	21,081	134	6,086	12,897	19,117	90.68	+ 433
Total 2005 (km^2)		133	6,173	12,378	18,684	88.68	
Change from 2005 (km^2)		+ 1	- 87	+ 519	+ 433	+ 2.00	

Source: India State of Forest Reports 2001 and 2011

The area covered by the forest has increased since 2005 by about 430 km^2 or 2% of state land; however, the above data reveals the virtual decrease of canopy (trees) density in the state, i.e., loss of moderately dense forest by 87 km^2 and increase of open forest by 519 km^2. The FSI explained in its

report that the changes are attributable to two reasons, namely, interpretational changes of satellite images pertaining to the seasons that coincided with the peak shifting cultivation activities, and the other changes in customary cultivation practices. The latter reason means that old shifting cultivation patches have been converted to horticulture crops like banana plantation and pineapple orchards thus preventing growth of secondary forests.

(2) Altitude Zone-wise Forest Cover

The forest cover of the state in different altitude zones is given in Table 4.10.6.

Table 4.10.6 Altitude Zone-wise Forest Cover

Altitude Range (EL)	Geographical Area (km^2)	VDF (km^2)	MDF (km^2)	OF (km^2)	Total (km^2)
0 - 500 m		15	1,971	6,129	8,115
500 - 1,000 m		56	2,872	5,001	7,929
1,000 - 2,000 m		62	1,241	1,765	3,068
Above 2,000 m		1	2	2	5
Total		134	6,086	12,897	19,117

Source: India State of Forest Report 2011

(3) Types of Forest

FSI classifies the forest in Mizoram into four groups according to Champion and Seth Classification System (1968). The prevailing forest groups are "Tropical Semi Evergreen Forest" with an area coverage of 71.94%, followed by "Tropical Moist Deciduous Forest" (27.4% coverage), "Sub-tropical Pine Forest" (0.62% coverage), and "Sub-tropical Broadleaved Hill Forest" (0.04% coverage).

(4) Bamboo

Bamboo is an important no-wood forest resource found in forest as well as non-forest areas. It is used as a food and housing material as well as in value addition and industrial activities. Bamboo vegetation is classified into five categories, i.e.: pure bamboo, dense bamboo, scattered bamboo, bamboo present but clumps completely hacked, and bamboo regeneration.

It may not be exaggerated to call Mizoram a bamboo state. The total bamboo bearing area in Mizoram is assessed to be 9,245 km^2 in the India State of Forest Report 2011, occupying 6.6% of the entire country's bamboo area of 139,577 km^2, and corresponding to 43.8% of state land (21,081 km^2). Occurrence of pure bamboo is observed to be maximum in Mizoram (226 km^2) followed by Arunachal Pradesh (217 km^2), and Manipur (192 km^2). The dense bamboo in Mizoram (6,116 km^2) is ranked second after Arunachal Pradesh (217 km^2). The number of bamboo culms in Mizoram is estimated at about 22 billion. No accurate data on district-wise bamboo area is available at present; the EFD's internal information indicates that the bamboo vegetation is prevailing in the three northern districts of the state, namely: Aizawl, Mamit, and Kolasib.

Bamboo is prevailing at an altitude ranging from 400 m to 1,500 m above mean sea level. Bamboo forests are found mainly along the river banks and abandoned jhumland (shifting cultivation) as a dominant secondary vegetation. There are 20 species of bamboos in Mizoram of which *Melocanna baccifera* is the dominant forest resource of the state. They are widely used for construction of man-made houses, furniture, fencing, weaving, and pulping. The shoots are widely eaten during the rainy season as a dominant food item.

Bamboos are easy to grow and useful for people's livelihood; however, they have some characteristics that render them less attractive to prospective growers, harvesters, and users. Some bamboo species are known to have a life cycle of a fixed length after which they flower and die and a new generation emerges from the seedlings. In Mizoram, prevailing species, i.e., *Melocanna baccifera* and *Bambusa tulda*, both have lifecycles of 48 years. The fruits of bamboo are edible and the sudden enormous increase causes a rapid explosion of the rat population. The rats not only devastate the naturally regenerating seeds and seedlings and thereby reduce the generation rate, but also destroy other crops and stored grains. This natural phenomenon results in serious famines, such as those that took place in

1915, 1863, 1911, 1959, and 2007 in Mizoram, known as the 'Mautam' famine. Paddy production in 2006/07 and 2007/8 decreased sharply down to 40% and 15%, respectively.

4.10.3 Timber and Non-timber Products

The forests in Mizoram are being managed with a vision to "achieve well-stocked high-quality forests with rich bio-diversity for maintaining ecological balance and ensuring stability while meeting the forest-based needs of the local people". Growing stock of timber is limited in the forest; therefore, there is very little scope for commercial felling of trees in Mizoram. The non-timber forest products (NTFPs) are also out of systematic commercial activities except bamboos and broomsticks which are specifically local products in Mizoram crafted for sweeping brooms. Several types of mushrooms are seen in the open markets in Mizoram; however, these productions are quite within small dwellers in and around the forests. The EFD appeals the promotion of medicinal plants to be grown in the forest; however, it seems to be still on a conceptual stage for future development. Table 4.10.7 shows the quantities of forest production for the last five-year period.

Table 4.10.7 Quantity of Forest Production in Mizoram

Year	Teak (m^3)	Round Timber (m^3)	Sawn Timber (m^3)	Firewood (m^3)	Bamboo ('000) (nos.)	Broomstick (metric ton)
2008/09	3,672	74	1,217	2,115	6,126	128
2009/10	-	11	605	5,027	4,257	900
2010/11	-	39	1,203	7,165	3,586	173
2011/12	110	58	1,461	7,468	452	223
2012/13	1,681	417	2,222	15,927	114	579

Note: (1) Teak quantity is privately extracted production and transported outside Mizoram.
(2) Quantities in table do not include those in three autonomous districts of Chakma, Lai and Mara.
Source: Environment and Forest Department, Mizoram

The above figures show the officially confirmed quantities, and there seems to be some larger quantities of products illegally extracted. For reference only, the district-wise quantity of forest production in the 2012/13 is shown in Table 4.10.8. This data indicates that the forest productions are active in the northern part of Mizoram close to the border of Assam State where there is a large demand of timber products in its market.

Table 4.10.8 District-wise Forest Production, 2012/13

Forest Division	District	Teak (m^3)	Round Timber (m^3)	Sawn Timber (m^3)	Firewood (m^3)	Bamboo ('000) (nos.)	Broomstick (metric ton)
1.Aizawl	Aizawl		376	283	6,377	28.8	4.0
2.Kolasib	Kolasib			140	43	29.6	396.7
3.Mamit	Mamit			186	29	3.3	49.7
4.Kawrthah	Mamit	1,681		195		1.7	106.5
5.Thenzawl	Serichip & Lunglei			503	41	15.9	1.5
6.Lunglei	Lunglei			169	125	1.5	
7.Tlabung	Lunglei					3.7	6.0
8.Lawngtlai	Lawngtlai						
9.N. Vanlaiphai	Serichip & Lunglei			696	683		
10.Champhai	Champhai			45	8,610	26.4	
11.Darlawn	Aizawl		41	4	19	3.1	14.2
Total		1,681	417	2,222	15,927	114.0	579.0

Note: (1) EFD divides the state into 14 divisions for forest operation, and these divisions do not necessarily coincide with the administrative districts.
(2) Quantities in three autonomous districts of Chakma, Lai and Mara are not available.
Source: Environment and Forest Department, Mizoram

4.10.4 Community Forest Management

(1) Traditional Community-based Forest Management

i) The forest management in Mizoram has been traditionally administered by the village chieftain, having absolute decision-making authority, who is the supreme head of the village council. This authority is implemented for Jhumming (shifting cultivation) regulation within the territory of the village forest. This traditional administration was legislated in 1954 as "the Lushai Hills (Mizo) District (Jhumming) Regulation", and the rules of distribution of Jhum land was amended in 1985, as outlined below.
ii) The village council shall have the power to distribute land for Jhum within the village;
iii) The village council shall submit a report to the government in September, annually, describing the extent of the Jhumming lands and number of households benefitted; and
iv) The government shall coordinate disputes arising from land distribution with power to give the final decision.

(2) Joint Forest Management (JFM)

(a) Legal Setting of JFM

In 1998, the Government of Mizoram introduced the JFM scheme to make local people participate actively in forest conservation. This was based on the government's serious concern about the continued degradation of the forest area in the state due to excessive biotic pressure like illicit felling of trees, jhumming, and fire encroachment in the government forests. JFM is constituted by two parties; one is the state government represented by EFD and the other one is the village forest development committee (VFDC). Upon the guidance of EFD through its range officer, the VFDC is formed with the agreement of a minimum of 50% of households in the village, and registered in the division forest office concerned. A managing committee has to be formed in the VFDC, and composed of the village council president (VCP), representatives elected by VFDC members, representatives of school/college teachers, representatives of NGOs, and the officer-in-charge of EFD.

The duty of VFDC is to ensure protection of the forests against grazing fire, illicit felling of trees, theft of forest products, and encroachment of forestlands, while VFDC is given various fringe benefits as the forest beneficiaries. Members of VFDC are entitled to grasses, leaves, fruits, fallen twigs, lops and tops, prunings and fuelwood free of cost from the designated JFM areas of forests. In addition, the surplus out of silvicultural thinnings and fellings are disposed of VFDC's members (beneficiaries), and the benefit arising from the sale of forest produce is shared among the government, beneficiaries, and VFDC in the ratios of 50% to the government, 30% to beneficiaries, and 20% to a special fund to be called "Village Forest Development Fund" operated by VFDC.

The voluntary agencies/NGOs like Yong Mizo Association (YMA) and Mizo Hmeichhe Insuihkhawm Pawl (MHIP) are involved in the activities of VFDC for planning, protection, regeneration, and development of forestlands and other government lands covered under JFM. The NGOs perform all other functions in an ex-officio capacity of the members of managing committees, but are not entitled to any benefit accorded under the scheme.

(b) Present Status of VFDC

At present, there are 615 VFDCs formed in Mizoram, and the district-wise distribution is shown in Table 4.10.9

Table 4.10.9 District-wise VFDC Distribution

District	No. of VFDC in FDA			No. of VFDC
Mamit	1.	Kawrthah	23	88
	2.	Mamit	30	
	3.	Mamit Jhum	12	
	4.	Dampa	23	
Kolasib	5.	Kolasib	45	54
	6.	Kolasib Jhum	9	
Aizawl	7.	Aizawl	35	97

District	No. of VFDC in FDA			No. of VFDC
	8.	Aizawl Jhum	17	
	9.	Darlawn	37	
	10.	Wildlife Division	1	
	11.	Tawl Wildlife	7	
Champhai	12.	Champhai	60	84
	13.	Champhai Jhum	17	
	14.	Murlen Wildlife	6	
	15.	Lengteng	1	
Serchhip / Lunglei	16.	Thenzawl	24	57
	17	Thenzawl Jhum	21	
	18.	N. Vanlaiphai	12	
Lunglei	19.	Lunglei	40	101
	20.	Lunglei Jhum	21	
	21.	Tlabung	37	
	22.	Khawnglung	2	
	23.	Thorangtlang	1	
Lawngtlai	24.	Lai Autonomous District	32	77
	25.	Chakma Autonomous District	45	
Saiha	26	Chhimtuipui	8	57
	27.	Mara Autonomous District	39	
	28.	Mara Jhum	10	
Total				615

Note: FDA: Forest Development Agency formed under the implementation of National Afforestation Programme (NAP)
Source: Environment and Forest Department, Mizoram

4.10.5 Ongoing Forest and Wildlife Conservation Programmes

EFD is undertaking various forest and wildlife conservation programmes. These programmes except NLUP are outlined below.

(1) National Afforestation Programme (NAP) Scheme

NAP scheme is a 100% centrally sponsored scheme (CSS) for afforestation initiated in the 10th Five-Year Plan (2000-2005) by integrating several forest conservation programmes so far operated until the end of the 9th Plan, keeping in focus the decentralization agenda of the Indian government. The overall objective of the scheme is to develop the forest resources with people's participation, with focus on the improvement in livelihood of the forest-fringe communities, especially the poor. NAP scheme aims to support and accelerate the ongoing process of devolving forest protection, management, and development functions to decentralised institutions of the joint forest management committee (JFMC) at the village level, and forest development agency (FDA) at the forest division level.

The components of NAP scheme are afforestation, soil and moisture conservation, and entry point activity for village development. The NAP is being implemented through a two-tier structure of forest division level (FDA) and village level (JFMC). The district-level officers of relevant line departments of the state government are the members of FDA.

The Mizoram State was selected as a target state of the NAP scheme together with six other northeast states since 2000. As mentioned in Chapter 4.10.4 above, 28 FDAs and 615 JFMCs (VFDCs) have been formed by 2013. For the last 12-year period from 2002 to 2013, an area of 56,660 ha has been afforestated in Mizoram. The NAP scheme is continuing in the 12th Five-Year Plan (2012 - 2017), and an amount of Rs.100 lakh is allocated in its budget.

(2) Intensification of Forest Management (IFM) Scheme

IFM scheme is a revised version of the Integrated Forest Protection Scheme that was in operation during the 10th Five-Year Plan (2000-2005) and has been carried over in the 11th Five-Year Plan. The scheme is implemented financially on a 90:10 (GOI:state) sharing basis. The components of the scheme are ranging widely, and the main objectives are (i) forest fire control management and (ii) infrastructure development having the following subcomponents: working plan preparation / survey

demarcation and strengthening of infrastructure for forest protection. A provision of Rs.20 lakh is allocated in the 12th Five-Year Plan.

(3) National Bamboo Mission (NBM) Scheme

NBM scheme is a 100% CSS which envisages the increase in the areas under bamboo plantation of selected species with intensive management so that the yield improves from the present 3 MT/ha on an average to about 18 to 20 MT/ha. NBM scheme was set up in 2006, and simultaneously, Mizoram established the State Bamboo Mission, the nodal agency for carrying out all mandated activities, together with seven northeast states.

One of the major components of the NBM is to increase the coverage area of economically important bamboo species. In order to ensure supply of quality bamboo planting materials, it is necessary to make certified seeds from competent authorities. So far, the Bamboo Nursery Certification has been completed in the other seven states including Mizoram. The mission activities are taken up both in forest and non-forest areas. The schemes in forest areas are dealt directly by EFD through FDA, while non-forest areas are dealt by the Bamboo Development Agency guided by the Horticulture Department as its nodal department.

The mission's activities are as follows: to establish bamboo nurseries with a capacity of producing 15 to 20 lakhs of bamboo seedlings a year; to plant bamboo in forest and non-forest areas; to expand markets of bamboo products both domestically and internationally; and to develop human resources. The GOI delivers the budget directly to the State Bamboo Mission with an amount of about Rs.1,750 lakh annually for the last three-year period.

(4) Wildlife Preservation Scheme and Eco-development Scheme

EDF is engaged in the preservation of wildlife by designating one tiger reserve, two national parks, and seven wildlife sanctuaries on a 100% CSS basis. The network of protected areas provides healthy habitats for many wild animals, birds, and reptiles. The area set aside for long-term wildlife conservation is 1,728.75 km^2, corresponding to 8.2% of the state's land. A provision of Rs. 750 lakh is allocated in the 12th Five-Year Plan. The details of the protected areas (PAs) are shown in the following Table 4.10.10:

Table 4.10.10 Wildlife Protected Area

Name of Protected Area	District	Category	Area (km^2)	Year of Notification		Remarks
				Preliminary	Final	
1.Dampa Tiger Reserve (DTR)	Mamit	WLS	988	1989	1994	Core: 500 km^2 Buffer: 488 km^2
2.Murlen	Champhai	NP	100	1991	2003	
3.Phawngpui	Lawngtlai	NP	50	1991	1997	
4.Ngengpui	Lawngtlai	WLS	110	1991	1997	
5.Khawnglung	Lunglei	WLS	35	1991	2000	
6.Lengteng	Champhai	WLS	60	1998	2002	
7.Tawi	Aizawl	WLS	35.75	1998	2001	
8.Thorangtlang	Lunglei	WLS	50	2001	2002	198 km^2 to be added
9.Pualreng	Korasib	WLS	50	2001		Waiting for final notification
10.Tokalo	Saiha	WLS	250	2006	2007	
Total			1,728.75			

Note: WLS: Wildlife Sanctuary, NP: National Park
Source: Economic Survey Mizoram, 2012-13

The Ministry of Environment and Forest, GOI, is financially assisting villagers living at the periphery and around PAs in improving their livelihood through minimizing the level of dependency on forest and forest products. Under the Eco-development Scheme, they are given assistance in the form of free medical camps, distribution of fuel (LPG), poultry, piggery, cultivation of cash crops, terracing for irrigated paddy cultivation, pisciculture, insulation of water tank, solar lamp, and bee keeping.

4.10.6 Implementation and Progress of NLUP

(1) Objectives and Outline of EFD's NLUP

Under NLUP, EFD selected to implement the Bamboo Development Programme. The objectives of bamboo development are as follows: (i) to encourage commercial cultivation of bamboo for sustainable income of farmers; (ii) to increase productivity of bamboo for sustainable supply of raw materials for cottage industries and bamboo shoot processing; (iii) to rehabilitate traditional jhum cultivators into sustainable productive farming; and (iv) to minimise pressure on forests for timber by producing bamboo thick walls for construction purposes.

A unit of bamboo planting is set at 2 ha per family, and given an amount of Rs.50,000 for planting bamboo. The bamboo plantation project is operated during the five-year period. Plantation sites are selected mainly in accessible areas such as roadsides and riverbank for easier harvesting and transportation. Private land holders can take up bamboo plantation in their own land, while the landless are allotted the area on a lease basis. EFD provides the beneficiaries with bamboo seedlings produced at the bamboo nurseries selecting quality species, for which a specific fund is set aside.

Under the cultivated conditions, bamboo is well remunerative, as rhizomes will mature in the third year, while seedling origin crop would be ready for harvesting from the fifth year onwards. On an average, 5 culms per clump would be available upon maturity. One hectare of plantation with 500 clumps will yield 2,500 mature culms from the fifth year onwards, giving a return of Rs.100,000/ha per year for about 30 to 50 years until flowering.

(2) Progress and Performance

From 2011 to date, there are 2,609 families which were benefitted by bamboo development under NLUP. The total plantation area is 5,218 ha, with 2 ha for each family. The programme was operated in two phases as shown in Table 4.10.11.

The total fund disbursed for the two phases was about Rs.2,600 lakhs including 1st phase maintenance and 2nd phase development works. The 3rd phase and 4th phase beneficiaries are being selected by EFD.

Table 4.10.11 District-wise Bamboo Planting Beneficiaries

District	1st Phase	2nd Phase	Total
Mamit	72	87	159
Kolasib	37	73	110
Aizawl	129	216	345
Champhai	283	211	494
Serchhip	47	100	147
Lunglei	747	425	1,172
Lawngtlai	94	86	180
Saiha	-	2	2
	1,409	1,200	2,609

Source: Economic Survey Mizoram, 2012-13

4.11 Livelihood-related Infrastructure

4.11.1 Rural Development

Many programmes have been implemented by the Rural Development Department for alleviating poverty, reducing unemployment, and giving additional employment to people residing in rural areas. Among these programmes, Indira Awas Yojana (IAY) has provided financial assistance for constructing or upgrading houses of rural households living below the poverty line. Year-wise achievements under IAY are shown in Table 4.11.1. A total number of 19,570 houses have been constructed likewise, a total of 11,238 houses have been upgraded in 2011-12.

Table 4.11.1 Achievements under Indira Awas Yojana (IAY)

Year	Physical Achievement		Expenditure (Rs. In millions)
	No. of Houses Constructed	No. of Houses Upgraded	
2001 - 02	804	471	22.38
2002 - 03	838	467	23.11
2003 - 04	1,421	781	39.07
2004 - 05	1,397	752	46.89
2005 - 06	1,398	784	48.22
2006 - 07	1,261	652	39.24
2007 - 08	1,452	827	50.28
2008 - 09	3,151	2,028	152.87
2009 - 10	2,956	1,895	142.23
2010 - 11	2,572	1,674	149.85
2011 - 12	2,320	907	126.13

	District	No. of Houses Constructed		No. of Houses Upgraded	
		2010-11	2011-12	2010-11	2011-12
1	Mamit	329	302	266	80
2	Kolasib	180	142	146	115
3	Aizawl	266	218	215	176
4	Champhai	289	256	236	115
5	Serchhip	75	61	60	50
6	Lunglei	541	431	438	348
7	Lawngtlai	624	645	97	23
8	Saiha	268	265	216	-
	Total	**2,572**	**2,320**	**1,674**	**907**

Source: Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).

4.11.2 Road and Transportation

(1) General

Road transport, both commercial and non-commercial, is the most important mode of carrying goods and passengers within the state, inter-state, and along international borders of Bangladesh and Myanmar. Therefore, roads are the most important means of communication and transportation of goods and passengers, and thus serve as the lifeline of the state's economy.

The total length of all types of roads in Mizoram has increased considerably during the 11th Five-Year Plan, i.e., from 6,059.83 km in the beginning of 2007 to 7,437.13 km to date, which represents 23% increase during the past five years. The current road density of 0.40 km/km^2 is below India's national average of 0.66 km/km^2.

The details of the road length in Mizoram as of 2012 are shown in Table 4.11.2 and the road map is shown in *Source : Prepared by JICA Study Team*
Figure 4.11.1.

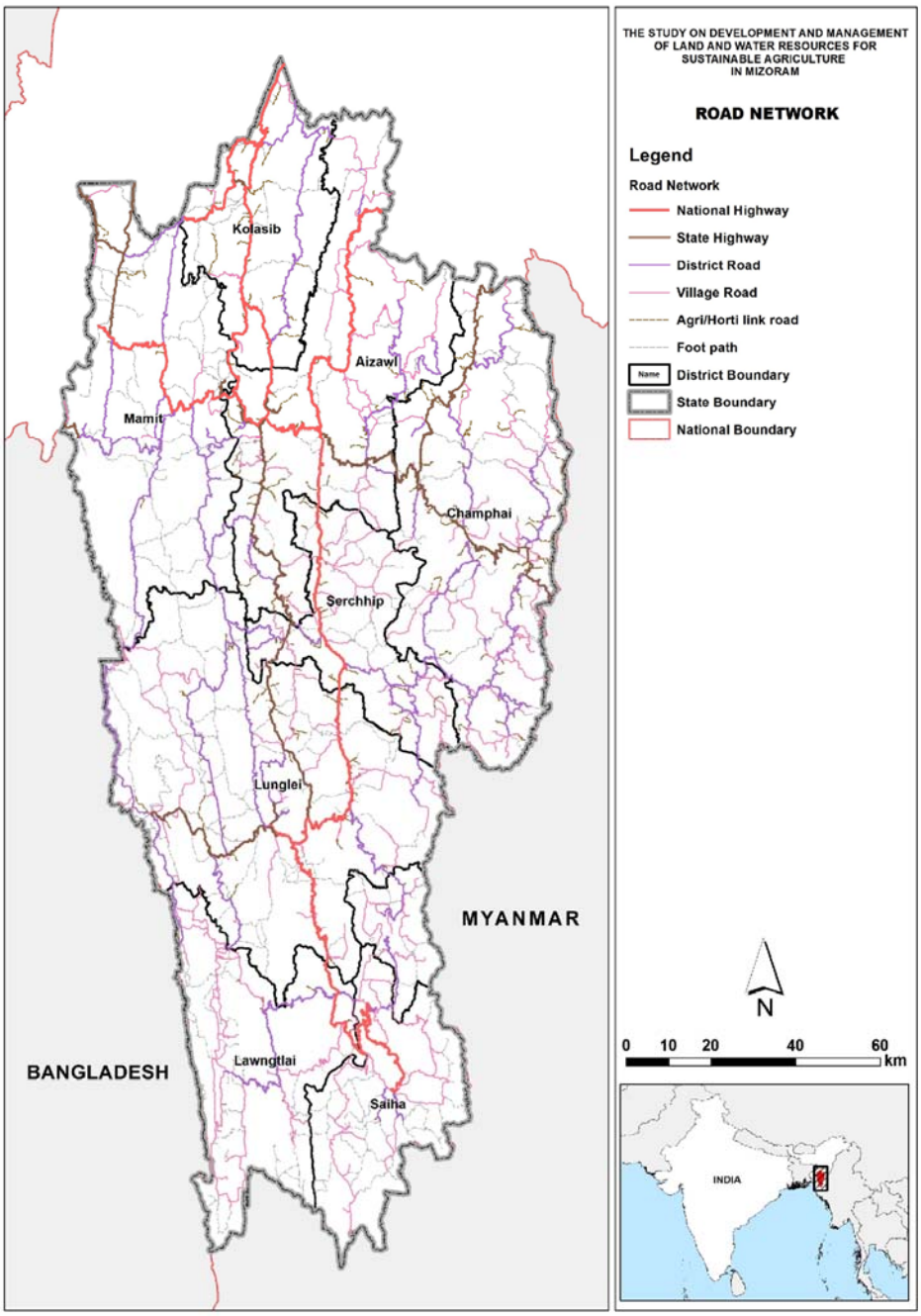
Table 4.11.2 Details of Road Length in Mizoram (Unit: km)

1	National Highway (NH)	986.00
2	State Highway (SH)	505.05
3	Major District Road (MDR)	709.90
4	Other District Road (ODR)	1013.77
5	Village Road (VR)	1061.70
6	Roads within Towns and Villages	591.645
7	City Road (CR)	355.487
8	Other Roads	1020. 576
A	Total of Roads under PWD	6244.128

1	State Highway (SH)	194.59
2	Major District Road (MDR)	225.75
3	Other District Road (ODR)	383.13
4	Village Road (VR)	41.00
5	Other Roads	191.720
B	Roads maintained by BRO (Border Roads Organisation)	11036.19
C	Roads maintained by other Department (RDD, DOA, FD, HD,)	257.00
	Grand Total (A)+(B)+(C)	7537.318

Source: Economic Survey, Mizoram, 2012-2013

The funds for the construction and maintenance of roads within Mizoram, other than those allocated annually under the state plan, include those coming from NLCPR (DoNER), NEC, PMGSY, NABARD, ADB Loan, World Bank Loan, and Ministry of State Road Transportation and Highway.



Source : Prepared by JICA Study Team

Figure 4.11.1 Mizoram Road Location Map

(2) Road Schemes Proposed for The 12th Five-Year Plan under PWD

The following Table 4.11.3 shows PWD's financial target for the 12th Five-Year Plan while Table 4.11.4 shows the detailed breakdown of the major proposed works.

Table 4.11.3 Abstract of Financial Target (Rs. in lakh)

Sl. No.	Name of Scheme	12th FYP Projected Outlay	Annual Plan 2012-13 Proposed Outlay
1	Direction and Administration	16,529.00	2,373.91
2	State Highways	26,700.00	0.00
3	Major District Roads	28,100.00	800.00
4	Other District Roads	36,700.00	800.00
5	Village Roads	1,900.00	800.00
6	City Roads	5,000.00	300.00
7	Roads within District Capitals	5,100.00	1,200.00
8	Town and Satellite Town Roads	4,500.00	900.00
9	NABARDs	24,846.00	4,340.00
10	ACA/CRF	6,410.00	1,036.00
11	EAP (World Bank Project)	20,000.00	1,550.00
12	Asian Development Bank (ADB)	647.00	3,000.00
13	JICA	19,800.00	0.00
TOTAL		**196,232.00**	**170,99.91**

Source: Economic Survey, Mizoram 2012-2013

Table 4.11.4 List of the Major Proposed Works Under PWD's 12th Five-Year Plan

Sl No	Name of Road	Length in km	Nature of Work	Amount (Rs. in lakh)
(I) STATE HIGHWAYS (SH)				
1	Artahkawn - Khawbung	67.00	Upgradation-1	11,400.00
2	Aizawl - Thenzawl - Lunglei	163.60	IRQP	6,100.00
3	Rengtekawn - NH-154	6.20	STR	1,000.00
4	Lungsen - Chawngte (L - C) Road	48.00	Upgradation-1	8,200.00
	Total of SH =	284.80	-	26,700.00
(II) MAJOR DISTRICT ROADS (MDR)				
1	Kawlkulh - Ngopa	63.00	Upgradation-1	10,700.00
2	Bairabi - Zamuang	28.00	IRQP	700.00
3	Mamit - Bairabi (upto B-Z junction)	36.00	IRQP	900.00
4	Buhchang - Phaisen	9.30	STR	600.00
5	Bilkhawthlir - Saiphai - Natusera	20.00	IRQP	500.00
6	Buarpui - Thenhlum	40.00	Upgradation-1	6,800.00
7	Khawzawl - Biate	60.00	STR	3,600.00
8	Suangpuilawn - E. Phaileng	46.00	STR	2,800.00
9	Suangpuilawn - Zawngin	12.00	Upgradation-2	1,500.00
	Total of MDR =	314.30	-	28,100.00
(III) OTHER DISTRICT ROADS (ODR)				
1	Phairuang - Thenhlum - Bunghmun (P - B) Road	100.00	Upgradation-1	17,000.00
2	Diltlang - Chawngtelui	10.00	Upgradation-2	1,200.00
3	NCV Road (Retained protion)	85.00	IRQP	2,150.00
4	Dawn - Haulawng	30.00	IRQP	750.00
5	Chekawn - N. Vanlaiphai	21.00	STR	1,300.00
6	Dungtlang - Vaphai - Farkawn	33.40	STR	2,000.00
7	Khawzawl - Rabung - Ngopa (Phalte)	64.00	STR	3,850.00
8	Rawpuichhip - Buarpui (Selected stretch)	75.00	STR	4,550.00

9	Zote - Chhipphir	9.50	Upgradation-2	1,150.00
10	Aibawk - R. Tlawng	14.00	IRQP	350.00
11	Zamuang - Hriphaw - Kolalian	24.00	STR	1,450.00
12	Aizawl - Reiek - W. Lungdar	37.00	IRQP	950.00
	Total of ODR =	502.90	-	36,700.00

Note: Upgradation-1 : The roads under this category are proposed to be geometrically upgraded to single lane MDR standard where the required minimum formation width is 7.50 m.
Upgradation-2 : The roads under this category are proposed to be geometrically upgraded to single lane ODR standard where the required minimum formation width is 6.00 m.
Strengthening (STR) : The roads under this category are (and will be, at the end of five years) in a high degree of deterioration and the normal process of renewal of the surface could not revive it to its normal functional stage. These roads need to be strengthened from their bases by at least two layers of WBM course in addition to the wearing course (pavement portion).
Improvement of Riding Quality Programme (IRQP) : The roads under this category are in a comparatively better condition where most of the surface could be revived to its normal functional stage by renewal. However, few portions of these roads need to be treated by pot-hole filling in addition to laying of premix carpet finished by seal coating.
Source: Economic Survey, Mizoram 2012-2013

(a) Second World Bank Project

During the 12th Five-Year Plan, it is proposed to implement the Rawpuichhip – Buarpui – Thenhlum – Lungsen (Chhumkhum) - Chawngte – Diltlang Multi Modal Project as a World Bank-aided Project.

(b) Tranche – II :

Under Tranche-II of ADB-aided road project, it is proposed to undertake the upgrading of the Serchhip – Buarpui Road. The length of the road is 55.00 km.

(c) Tranche – III :

Under Tranche-III of the ADB-aided road project, it is proposed to undertake the upgrading of the Champhai - Khawbung Road. The length of the road is 68.20 km.

(d) JICA Project (Rs.198,000 lakh)

The Government of Mizoram has intended to take up the Road Network Development Project under ODA loan assistance from the Japan International Cooperation Agency (JICA) for new construction and upgrading of the existing state highways (including consultancy services) (under JICA).

The total amount proposed under JICA is Rs.198,000 lakh covering 427.00 km length of road.

- Construction of Aizawl Ring Road (64.53 km): Rs.32,265 lakh
- Upgradation of Serchhip/Keitum –Chekkawn – E.Lungdar – Khawbung –Zokhawthar Road via Hruaikawn (134.39 km) : Rs.54,428 lakh
- Construction of Hnahlan (Khuangphah) – R. Tuvai Road (78.66 km):Rs.40,038 lakh
- Construction of Khamrang (Tuitun) – Meidum Road (47.25 km): Rs.21,026 lakh
- Upgradation of Aizawl – Samtlang – Darlung – New Khawlek Road via Kanghmun (Ramrikawn) (77.43 km): Rs.34,456 lakh
- Construction of Lunglei – Thehlep – Putlungasih Road (24.74 km): Rs.3,711 lakh

(e) Kaladan Multi Modal Transit Transport Project (Phase A of SARDP-NE)

This project was initiated by the Ministry of External Affairs, Government of India to build transport communication to link Kolkata Port with the northeastern region via Mizoram and through Myanmar. The route consists of sea route (720 km) from Kolkata-Sittwe (Akyab) in Myanmar, river route along the Kolodyne River from Sittwe-Kaletwa (222 km) in Myanmar up to which 500 tons capacity of vessel can ply, inland road from Kaletwa-Indo Myanmar border (62 km), and then from the Myanmar border to NH-54 at Lawngtlai (100 km) in Mizoram.

The Kaladan Multi Modal Transit Project Transport Project within Mizoram, from 100 km of double lane highway to connect Kolkata Port via Myanmar and sea route, has been sanctioned for an amount of Rs.575.69 crores. This was recently declared as the National Highway NH-502A. The work was physically started in February 2011 and formation cutting of 60 km amounting to Rs.221.86 crores have already been completed.

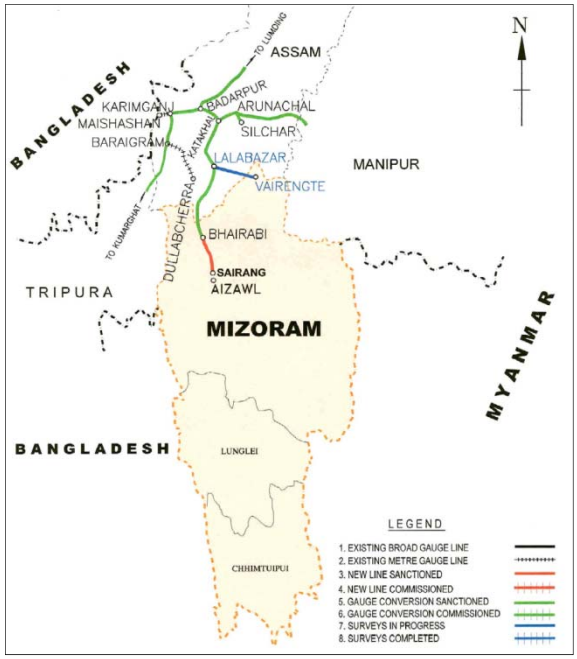
(3) Railways

Railway line extends to Mizoram in Bairabi, near Assam border, measuring only 1.5 km from Katakal Junction. Passengers and goods arrive at this station once a day. Railways also play a vital role in carrying essential commodities to the state. Since all major towns are far from Bairabi, the role of railways in the economy of Mizoram until today is almost negligible.

The new railway line project from Bairabi to Sairang with a length of 51.38 km was sanctioned in the railway budget of 2008-2009 at a total cost of Rs.510.34 crores. The Task Force on National Railway Project has also been constituted to function as a mechanism of continuous interaction between the railway authorities and the state government.

Source:MoDONER

Figure 4.11.2 Kaladan Multi Modal Transit Transport Project Plan Map



Source: MoDONER

Figure 4.11.3 Railway Plan Map

(4) Inland Waterways

The Transport Department has completed the inland waterway project on the Tlawng River with the approved estimated cost of Rs. 527.93 lakh financed by the Ministry of Shipping. The physical progress achieved so far with the amount received from the Government of India is 100%.

New project proposals on inland water transport on the Tuichawng River and the Khawthlangtuipui River are proposed for implementation in 2013-14 and the detailed project reports have also been submitted to the Ministry of Shipping in January 2013.

4.11.3 Water Supply and Sanitation

The National Rural Drinking Water Programme (NRDWP) became effective from April 2009, and envisaged to cover all rural habitats by 2012.

Table 4.11.5 shows the number of habitations covered with drinking water supply. The total number of habitations was revised to 777 in 2006-07 after a new habitation survey was conducted. Due to rapid population increase, drying up of water sources, and natural calamity from 2006-07 to 2008-09, the number of fully covered habitations decreased. However, as of April 2012, all habitations were either fully or partially covered with drinking water supply. The district-wise data is only available for 2010-11 although the numbers of partially covered or not covered are not available. Kolasib gained the highest coverage (34.2%), followed by Serchhip (27.3%), and Mamit (25.3%).

Table 4.11.5 Number of Habitations Covered with Drinking Water Supply

No.	Year/ District	Total No. of Habitations	Fully Covered (Nos.)	Partially Covered (Nos.)	Not Covered (Nos.)
1	2001 - 02	911	431	480	0
2	2002 - 03	807	521	286	0
3	2003 - 04	807	636	171	0
4	2004 - 05	807	695	112	0
5	2005 - 06	807	781	26	0
6	2006 - 07	777	355	294	128
7	2007- 08	777	471	219	87
8	2008 - 09	777	526	185	66
9	2009 - 10	777	472	278	27
10	2010 - 11	777	121	n.a.	n.a.
11	As of 01.04.2012	777	711	66	0
District-wise (2010 - 11)					
1	Mamit	87	22	n.a.	n.a.
2	Kolasib	38	13	n.a.	n.a.
3	Aizawl	116	18	n.a.	n.a.
4	Champhai	92	3	n.a.	n.a.
5	Serchhip	33	9	n.a.	n.a.
6	Lunglei	186	31	n.a.	n.a.
7	Lawngtlai	155	12	n.a.	n.a.
8	Saiha	70	13	n.a.	n.a.
	Total:	**777**	**121**	n.a.	n.a.

Note: Not Covered: up to 10 lpcd (litre per capita per day); Partially Covered: above 10 lpcd up to 40 lpcd; Fully Covered: above 40 lpcd.
Source: Statistical Abstract of Mizoram (2011), Directorate of Economics and Statistics, Government of Mizoram and Economic Survey Mizoram, 2012-13.

Table 4.11.6 shows the achievements under some projects for urban water supply. During the ten-year period until 2010/11, water connections were provided to 33,061 houses, which are around 28% of the total urban households.

Table 4.11.6 Achievement of Urban Water Supply

No.	Year	No. of Houses Provided with Water Connections During the Year
1	2001 - 02	2,288
2	2002 - 03	2,157
3	2003 - 04	2,173
4	2004 - 05	3,026
5	2005 - 06	2,866
6	2006 - 07	3,637
7	2007 - 08	3,163
8	2008 - 09	3,843
9	2009 - 10	5,099
10	2010 - 11	4,809
	Total	**33,061**

District-wise (2010 - 11)			No. of Urban Households (2011 Census)
1	Mamit	199	3,192
2	Kolasib	512	9,662
3	Aizawl	2,352	65,196
4	Champhai	704	10,068
5	Serchhip	171	6,291
6	Lunglei	577	14,115
7	Lawngtlai	104	3,910
8	Saiha	183	4,607
	Total	**4,802**	117,041

Source: Statistical Abstract of Mizoram (2011) and 2011 Census.

Table 4.11.7 shows the number of water supply facilities, which were developed during the ten-year period until 2010/11. Since the number of inhabited villages was around 704, it seems that these numbers showed good achievements.

Table 4.11.7 Rural Water Supply Facilities

No.	Year	No. of Villages Provided with Piped Water Supply	No. of Hand Pump Tube Wells Installed	No. of Rain Water Harvesting Tanks Constructed	No. of Village Springs Improved	No. of Impounding Reservoirs Constructed	No. of Rural Schools Provided with Drinking Water Facilities
1	2001 - 02	117	94	1,711	15	1	80
2	2002 - 03	102	256	2,629	114	7	100
3	2003 - 04	88	263	1,567	9	7	180
4	2004 - 05	73	88	485	122	7	140
5	2005 - 06	92	68	805	32	2	400
6	2006 - 07	94	49	1,257	19	6	1,986
7	2007 - 08	81	0	1,616	116	1	0
8	2008 - 09	54	222	504	16	1	0
9	2009 - 10	110	111	789	19	1	0
10	2010 - 11	65	91	38	16	0	126
	Total	**876**	**1,242**	**11,401**	**478**	**33**	**3,012**

Source: Statistical Abstract of Mizoram (2011).

Table 4.11.8 shows the availability of latrine facility by type. Percentage of households having latrines in Mizoram in 2011 was 92%, which was nearly double of the national average (47%).

Table 4.11.8 Availability and Type of Latrine Facility

No.	State	Percentage (%) of Households Having							
		Water Closet		Pit Latrine		Other Latrines		No Latrine	
		2011	2001	2011	2001	2011	2001	2011	2001
0	INDIA	**36.4**	**18.0**	**9.4**	**11.5**	**1.1**	**6.9**	**53.1**	**63.6**
1	Jammu & Kashmir	33.0	8.8	5.5	17.4	12.7	26.9	48.8	46.9
2	Himachal Pradesh	60.7	11.4	8.1	14.6	0.3	7.4	30.9	66.6
3	Punjab	59.3	20.4	19.2	24.3	0.8	12.1	20.7	43.2
4	Chandigarh	87.1	68.3	0.5	1.6	0.1	8.9	12.4	21.1
5	Uttarakhand	53.2	15.4	11.9	18.7	0.7	11.0	34.2	54.8
6	Haryana	50.4	10.9	17.4	22.3	0.8	11.3	31.4	55.5
7	NCT of Delhi	85.7	45.5	1.8	16.4	2.1	16.1	10.5	22.0
8	Rajasthan	27.6	11.9	6.5	10.5	0.8	6.6	65.0	71.0
9	Uttar Pradesh	29.8	8.0	4.2	10.3	1.7	13.2	64.4	68.6
10	Bihar	20.1	7.9	2.5	6.5	0.5	4.8	76.9	80.8
11	Sikkim	75.0	32.1	12.0	26.3	0.2	5.0	12.8	36.6
12	Arunachal Pradesh	38.4	11.0	18.8	25.8	4.8	19.4	38.0	43.7
13	Nagaland	47.7	8.7	27.7	45.9	1.1	15.9	23.5	29.4
14	Manipur	46.6	8.7	34.6	66.9	8.0	6.5	10.7	18.0
15	**Mizoram**	**60.8**	**19.5**	**30.6**	**62.2**	**0.6**	**7.3**	**8.1**	**11.0**
16	Tripura	24.8	11.7	60.2	62.1	1.0	7.7	14.0	18.6
17	Meghalaya	38.2	12.3	23.3	30.5	1.5	8.3	37.1	48.8
18	Assam	28.5	15.9	34.7	43.9	1.8	4.8	35.1	35.4
19	West Bengal	31.9	20.9	25.6	17.5	1.4	5.2	41.2	56.3
20	Jharkhand	20.4	10.7	1.4	3.3	0.3	5.7	78.0	80.3
21	Odisha	17.7	8.8	3.5	4.0	0.8	2.1	78.0	85.1
22	Chhattisgarh	21.0	8.9	3.5	2.4	0.2	2.9	75.4	85.8
23	Madhya Pradesh	26.1	12.5	2.3	5.9	0.4	5.6	71.2	76.0
24	Gujarat	52.6	31.1	4.5	8.7	0.3	4.8	42.7	55.4
25	Daman & Diu	77.1	34.6	1.0	7.2	0.1	2.1	21.8	56.1
26	D & N Haveli	53.7	30.8	0.7	1.1	0.3	0.7	45.3	67.4
27	Maharashtra	43.5	21.9	8.8	8.9	0.9	4.3	46.9	64.9
28	Andhra Pradesh	43.1	18.1	5.4	8.5	1.1	6.3	50.4	67.0
29	Karnataka	36.9	18.6	13.6	13.4	0.7	5.5	48.8	62.5
30	Goa	74.1	29.8	4.4	18.8	1.2	10.0	20.3	41.4
31	Lakshadweep	97.4	82.4	0.4	0.5	0.0	6.3	2.2	10.8
32	Kerala	66.7	65.2	28.3	12.4	0.2	6.5	4.8	16.0
33	Tamil Nadu	41.2	23.2	6.0	7.3	1.1	4.6	51.7	64.8
34	Puducherry	67.4	45.7	0.8	1.8	0.3	2.5	31.6	50.1
35	A & N Islands	67.0	31.3	2.9	10.6	0.2	11.4	29.9	46.7

Source: Houses Household Amenities and Assets - Latrine Facility, Census of India 2011 and Office of the Registrar General & Census Commissioner India, Ministry of Home Affairs.

4.11.4 Rural Electrification

The total installed generation capacities as of 2011/12 were 0.50 MW for diesel, 29.35 MW for hydel, and 22.92 MW for thermal. In 2011/12, only 5% of the total power available for the state was covered by diesel and hydel generation within the state and the remaining 95% was imported mainly from Central Sector Projects.

Scheme for Rural Electricity Infrastructure and Household Electrification (RGGVY) was started in Mizoram in September 2008. Electrification of 93 un-electrified villages, intensive electrification of 346 villages and free connection to 14,920 BPL households were completed. By April 2012, all villages in Kolasib, Champhai, and Serchhip had been electrified.

Table 4.11.9 Number of Villages Electrified

No.	District	No. of Inhabited Villages	Electrified Villages (As of 1 April 2011)		Electrified Villages (As of 1 April 2012)	
			No.	%	No.	%
1	Mamit	82	75	91.46	81	98.78
2	Kolasib	32	30	93.75	32	100.00
3	Aizawl	109	99	90.83	104	95.41
4	Champhai	85	85	100.00	85	100.00
5	Serchhip	32	32	100.00	32	100.00
6	Lunglei	160	146	91.25	150	93.75
7	Lawngtlai	139	89	64.03	116	83.45
8	Saiha	68	53	77.94	57	83.82
	Total	**707**	**609**	**86.14**	**657**	**92.93**

Source: Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).

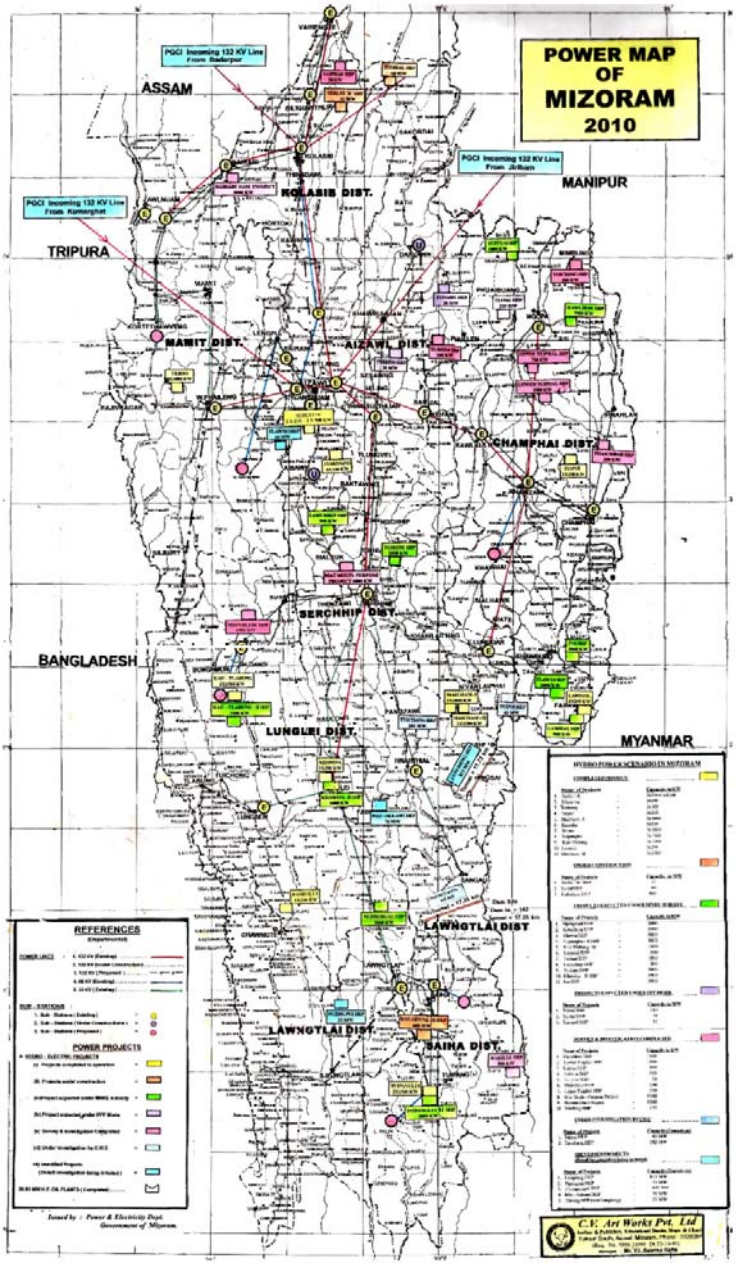
The power is allocated to the state through the NE grid at 132 kV level through the following lines:

i) 132 kV S/C Jiribum (Manipur) to Aizawl (Power Grid) line.
ii) 132 kV S/C Badarpur (Assam) to Aizawl (Power Grid) line.
iii) 132 kV S/C Kumarghat (Tripura) to Aizawl (Power Grid) line.

These lines converge into the 132 kV PGCIL Substation at Luangmual (Aizawl) from which power is transmitted to various states' own 132 kV substations in Mizoram for further distributions at various voltage levels. (Refer to next page for Power Map of Mizoram)

The existing power networks in the state consists of the following:

1	Diesel engine	1 No. (0.5 MW)
2	Hydel generating system	11 Nos. (29.35 MW)
3	132 kV lines	728.96 km
4	66 kV lines	17 km
5	33 kV lines	972.03 km
6	11 kV lines	4947.64 km
7	LT lines	2717.61 km
8	132 kV grid substation	7 Nos. (128.10 MVA)
9	33 kV grid substation	
	a)33/11 kV at 132 kV substations	7 Nos. (50.50 MVA)
	b) 33/11 kV substations	41 Nos. (157.90 MVA)
10	Distribution transformers	1,634 Nos. (188.323 MVA)
11	Street lights	10,647 Nos.



Source : CV Art Works Pvt. Ltd.

Figure 4.11.4 Power Map of Mizoram

4.11.5 Education

As previously mentioned, Mizoram has become one of the most literate states in India. Table 4.11.10 shows the number of educational institutions by levels. They have steadily increased during the last decade in all levels except college. Many of them (in all levels) are concentrated in Aizawl. In addition, Mizoram University (MZU) and Pachhunga University College (Constituent College of MZU) are also located in Aizawl.

Table 4.11.10 Number of Educational Institutions

No.	Year	Primary Schools	Middle Schools	High Schools	Higher Secondary Schools	No. of Colleges
1	2001 - 02	1,377	851	370	33	26
2	2002 - 03	1,504	911	409	47	26
3	2003 - 04	1,504	908	443	71	26

4	2004 - 05	1,481	939	448	67	23
5	2005 - 06	n.a.	n.a.	484	76	23
6	2006 - 07	1,700	1,081	502	80	21
7	2007 - 08	1,752	1,090	508	82	21
8	2008 - 09	1,783	1,253	502	86	21
9	2009 - 10	1,782	1,313	521	95	21
10	2010 - 11	1,821	1,353	528	98	21
11	2011 - 12	1,855	1,383	543	113	21
District-wise (2010 - 11)						
1	Mamit	149	103	35	4	2
2	Kolasib	125	97	28	4	1
3	Aizawl	489	421	200	48	9
4	Champhai	217	182	69	12	2
5	Serchhip	109	86	35	6	1
6	Lunglei	353	216	98	16	3
7	Lawngtlai	252	156	42	4	2
8	Saiha	127	92	31	4	1
	Total	**1,821**	**1,353**	**538**	**98**	**21**

Source: Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).

Table 4.11.11 shows the teacher-pupil ratios by education level and by district. There is not much difference among the districts. The national average ratios were 35 for primary in 2011 and 25 for secondary (high school) in 2010. Compared with the national level, the situation in Mizoram is regarded as much better.

Table 4.11.11 Teacher - Pupil Ratio by Education Level

#	Year	Primary School			Middle School			High School			Higher Secondary School		
		Teachers	Pupils	Ratio	Teachers	Pupils	Ratio	Teachers	Pupils	Ratio	Teachers	Pupils	Ratio
1	2001 - 02	5,429	114,229	1:21	5,747	53,130	1:09	2,853	43,030	1:15	485	9,076	1:19
2	2002 - 03	5,855	116,303	1:20	5,599	56,490	1:10	2,923	39,875	1:14	648	12,555	1:19
3	2003 - 04	5,861	120,217	1:21	5,608	58,623	1:10	3,108	45,200	1:15	669	16,890	1:25
4	2004 - 05	5,469	102,807	1:19	7,067	56,038	1:09	3,592	43,161	1:12	845	10,283	1:12
5	2005 - 06	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3,694	41,610	1:11	854	10,555	1:12
6	2006 - 07	8,099	130,342	1:16	7,271	58,533	1:09	3,768	44,322	1:12	929	11,762	1:13
7	2007 - 08	8,002	134,656	1:17	6,846	57,399	1:08	3,935	43,675	1:11	941	12,816	1:14
8	2008 - 09	8,716	151,899	1:17	7,754	64,887	1:08	3,886	44,576	1:11	1,058	14,649	1:13
9	2009 - 10	8,477	156,396	1:18	7,564	66,776	1:09	3,853	48,811	1:13	1,224	17,049	1:14
10	2010 - 11	8,310	166,152	1:20	7,824	69,318	1:09	3,870	50,252	1:13	1,224	18,437	1:15
District-wise (2010 - 11)													
1	Mamit	534	10,889	1:20	491	4,211	1:09	200	1,979	1:10	38	305	1:08
2	Kolasib	588	12,461	1:13	521	5,085	1:10	205	3,165	1:15	59	722	1:12
3	Aizawl	2,550	50,444	1:20	2,702	25,575	1:09	1,653	23,275	1:14	636	11,148	1:18
4	Champhai	925	19,364	1:21	998	8,945	1:09	435	5,445	1:13	124	1,236	1:10
5	Serchhip	498	8,643	1:17	499	4,412	1:09	232	3,189	1:14	79	823	1:10
6	Lunglei	1,441	24,617	1:17	1,229	10,053	1:08	662	6,432	1:10	190	2,571	1:14
7	Lawngtlai	984	27,199	1:28	804	6,964	1:09	267	3,495	1:13	37	668	1:18
8	Saiha	790	12,535	1:16	580	4,073	1:07	216	3,272	1:15	61	964	1:16
	Total	**8,310**	**166,152**	**1:20**	**7,824**	**69,318**	**1:09**	**3,870**	**50,252**	**1:13**	**1,224**	**18,437**	**1:15**

Source: Statistical Abstract of Mizoram (2011).

4.11.6 Health and Medical Services

Health services envisage to achieve overall improvement in the health status of people particularly in the rural areas for raising productivity and growth of the economy through better access to quality

healthcare. Accordingly, a number of health infrastructures have been set up in Mizoram. Table 4.11.12 shows the number of medical institutes by type in Mizoram. Aizawl has relatively more medical institutions than in other districts.

Table 4.11.12 Number of Medical Institutions

No.	Year	Hospitals		Community Health Centres	Primary Health Centres	Sub-Centres
		Government	Private			
1	2001 - 02	10	4	9	57	351
2	2002 - 03	10	4	9	57	351
3	2003 - 04	10	4	9	57	351
4	2004 - 05	10	5	9	57	366
5	2005 - 06	10	7	9	57	366
6	2006 - 07	10	9	9	57	367
7	2007 - 08	10	12	9	57	366
8	2008 - 09	12	12	12	57	370
9	2009 - 10	12	12	12	57	370
10	2010 - 11	12	15	12	57	370
District-wise (2010 - 11)						
1	Mamit	1	0	1	7	30
2	Kolasib	1	1	1	5	28
3	Aizawl	5	10	4	10	94
4	Champhai	1	1	3	11	58
5	Serchhip	1	0	1	5	27
6	Lunglei	1	1	1	9	71
7	Lawngtlai	1	1	1	6	35
8	Saiha	1	1	0	4	27
	Total	**12**	**15**	**12**	**57**	**370**

Source: Statistical Abstract of Mizoram (2011).

Table 4.11.13 shows the number of beds in medical institutions in Mizoram. Aizawl has also relatively more beds than other districts. According to the National Health Profile of India 2012, one bed of government hospital (including CHCs) is for 879 people in the entire India. This figure is 844 in Mizoram, which is not so much different from the national average.

Table 4.11.13 Number of Beds in Medical Institutions

No.	Year	Government			Private/ Nursing Homes
		Hospitals	CHCs	PHCs	
1	2001 - 02	794	360	560	580
2	2002 - 03	794	360	560	580
3	2003 - 04	794	360	560	625
4	2004 - 05	911	270	570	744
5	2005 - 06	911	270	570	827
6	2006 - 07	944	270	570	827
7	2007 - 08	944	270	570	828
8	2008 - 09	1,011	270	570	828
9	2009 - 10	931	360	570	871
10	2010 - 11	932	360	570	934
District-wise (2010 - 11)					
1	Mamit	30	30	60	0
2	Kolasib	60	30	50	0
3	Aizawl	470	120	110	728
4	Champhai	60	90	90	20

5	Serchhip	60	30	50	0
6	Lunglei	152	30	90	100
7	Lawngtlai	30	30	50	60
8	Saiha	70	0	70	26
	Total	**932**	**360**	**570**	**934**

Source: Statistical Abstract of Mizoram (2011).

4.11.7 Communications

Telecommunication has been developed only recently in Mizoram. Table 4.11.14 shows the number of mobile connections (pre-paid and post paid mobile connections). During the last four years, the number has increased by about 70%. More than half (55.6%) of the connectors are in Aizawl. AIRTEL has the largest subscribers for mobile connections. Bharat Sanchar Nigam Limited (BSNL) is the comprehensive telecommunication service provider. It has 46,883 landline connections and 33,265 broadband connections aside from mobile phone connections.

Table 4.11.14 District-wise Number of Mobile Connections

No.	District	A1RTEL	BSNL	RELIANCE	AIRCEL	TATA INDICOM	VODAFONE	TOTAL
1	Mamit	0	5,588	2,015	11,821	0	400	19,824
2	Kolasib	24,726	9,156	9,446	8,853	0	2,000	54,181
3	Aizawl	120,000	128,187	75,800	43,853	2,416	10,000	380,256
4	Champhai	24,730	3,600	2,900	33,782	0	0	65,012
5	Serchhip	17,310	12,819	2,380	7,658	0	2,000	42,167
6	Lunglei	35,100	14,650	16,500	23,872	0	3,000	93,122
7	Lawngtlai	8,200	3,724	2,450	0	0	500	14,874
8	Saiha	10,119	5,400	1,442	0	0	300	17,261
	Total (As of Feb. 2012)	240,185	183,124	112,933	129,839	2,416	18,200	686,697
	Total (2011)	230,000	132,436	37,435	121,069	827	25,800	547,567
	Total (2010)	229,900	120,378	41,414	98,713	660	20,500	511,565
	Total (2009)	213,000	85,469	39,038	56,374	902	5,100	399,883

Note: Total of 2011, 2010, and 2009 are figures on pre-paid and post paid mobile connections.
Source: Statistical Abstract of Mizoram (2011) and Economic Survey Mizoram 2012-13.